

# FCC Test Report

## (Part 90)

Product Name : Advanced Industrial 4G/LTE Router, WWAN Failover Manager  
Model No : MX-200, MX-200e, M100  
FCC ID : QI3BIL-MX200-R

Applicant : Billion Electric Co., Ltd.  
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist.,  
New Taipei City 231, Taiwan (R.O.C.)

Date of Receipt : 2017/01/05  
Issued Date : 2017/02/18  
Report No. : 1710161R-HPUSP02V00  
Report Version : V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration of the equipment and evaluated measurement uncertainty herein.

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# Test Report

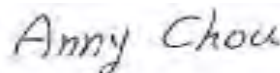
Issued Date : 2017/02/18

Report No.: 1710161R-HPUSP02V00



Product Name : Advanced Industrial 4G/LTE Router, WWAN Failover Manager  
Applicant : Billion Electric Co., Ltd.  
Address : 8F., No.192, Sec. 2, Zhongxing Rd., Xindian Dist., New Taipei  
City 231, Taiwan (R.O.C.)  
Manufacturer : Billion Electric Co., Ltd.  
Trade Name : BEC, Billion  
Model No. : MX-200, MX-200e, M100  
EUT Rated Voltage : DC 9-54V  
EUT Test Voltage : DC 12V(Power By Adapter AC120V/60Hz)  
Measurement Standard : FCC CFR Title 47 Part2 90  
Measurement Reference : TIA/EIA 603-D  
Test Result : Complied

Documented By :



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( Senior Adm. Specialist / Anny Chou )

Tested By :



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( Senior Engineer / Vorana Chen )

Approved By :



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( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Advanced Industrial 4G/LTE Router, WWAN Failover Manager
Model No.	MX-200, MX-200e, M100
Trade Name	BEC, Billion
IMEI No.	35907206
FCC ID	QI3BIL-MX200-R
Modulation	LTE Band 26 : QPSK/16-QAM
TX Frequency	LTE Band 26 : 814MHz~824MHz
Rx Frequency	LTE Band 26: 859~869MHz
Bandwidth	LTE Band 26: 1.4MHz/3MHz/5MHz/10MHz
HW Version	1.011
SW Version	1.04.1.103p
Antenna Type	Dipole

Note: 1.The EUT is including three models.

2.The difference of each model is shown as below:

#### Hardware & Software comparison table:

	MX-200	M100	MX-200e
<b>Trade Name</b>	BEC	Billion	BEC
<b>Hardware design</b>	PCBA/Layout/Scheme/ Key component/housing / interface ...100% same		
LTE antennas (SMA)	Detachable LTE Antenna *2pcs	Detachable LTE Antenna *2pcs	Detachable LTE Antenna *2pcs
GPS antenna (SMA)	1	1	1
SIM slot (2FF)	1	1	1
RS-232 (DB-9)	1	1	1
Ethernet Giga port	2	2	2
Power input	9-56VDC	9-56VDC	9-56VDC
External color	Casing: Metal/Black	Casing: Metal/Black	Casing: Metal/Black
<b>Software function</b>	with VPN	with VPN	without VPN

### 1.2. Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Cortec Technolgy Inc.	AN0727-64DP5BSM	0.71 dBi for 700-960MHz 3.7 dBi for 1710-2700MHz

### 1.3. Operational Description

The information contained within this report is intended to show verification of compliance of the 850MHz to the requirements of FCC 47 CFR Part 2, 90.

The EUT provide all functions described as above. The EUT is tested with maximum rated TX power via the Base Station simulator.

DEKRA has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined

as:

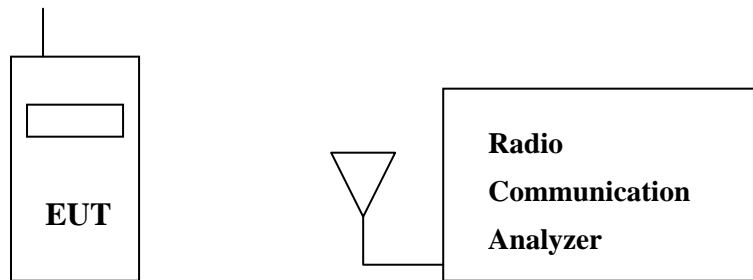
Test Mode:	LTE Band 26 (1.4M)-QPSK/16QAM
	LTE Band 26 (3M)-QPSK/16QAM
	LTE Band 26 (5M)-QPSK/16QAM
	LTE Band 26 (10M)-QPSK/16QAM

Note :

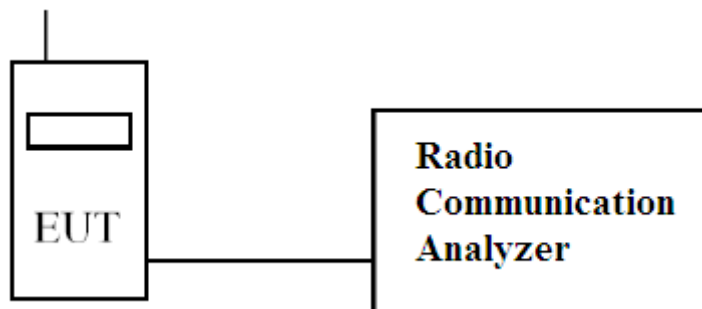
The maximum power levels are chosen in the LTE Band 26, only these modes were used for all tests.

## 1.4. Configuration of tested System

### (a) Configuration of Radiated measurement



### (b) Configuration of Conducted measurement



## 1.5. EUT Setup Procedures

- (1) Setup the EUT and simulators as shown on 1.3
- (2) Turn on the power of all equipments.
- (3) The EUT was set to communicate with MT8820C.
- (4) Repeat the above procedure (3).

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	22
Humidity (%RH)	25-75	51
Barometric pressure (mbar)	860-1060	988

The related certificate for our laboratories about the test site and management system can be downloaded from DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

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 FCC Engineering Laboratory  
 7435 Oakland Mills Road  
 Columbia, MD 21046  
 FCC Registration Number :92195

Site Name: DEKRA Testing and Certification Co., Ltd

Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,  
 Taiwan, R.O.C.

TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789

E-Mail : [info.tw@dekra.com](mailto:info.tw@dekra.com)

FCC Accreditation Number: TW1014

## 1.7. Type of Emission

Band	Bandwidth (MHz)	Modulation	
		QPSK	16QAM
26	1.4	1M09G7D	1M09W7D
26	3	2M74G7D	2M73W7D
26	5	4M50G7D	4M48W7D
26	10	9M04G7D	9M03W7D



**1.8. Voltages and AC currents**

LTE Band 26 (1.4M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.08A
	EUT Standby :	AC voltage : 120V , AC current : 0.05A
LTE Band 26 (3M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.08A
	EUT Standby :	AC voltage : 120V , AC current : 0.05A
LTE Band 26 (5M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.08A
	EUT Standby :	AC voltage : 120V , AC current : 0.05A
LTE Band 26 (10M)	EUT Transmitting (in maximum power) :	AC voltage : 120V , AC current : 0.08A
	EUT Standby :	AC voltage : 120V , AC current : 0.05A

## 2. Technical Test

### 2.1. Summary of test result

FCC Standard	Test Item	Result	Note
2.1046	Conducted Output Power	Pass	
90.635			
2.1049	Occupied Bandwidth	Pass	
90.209			
2.1051	Spurious Emission at Antenna Terminals	Pass	
90.691			
2.1051	Conducted Emission	Pass	
90.691			
2.1053	Field Strength of Spurious Radiation	Pass	
90.691			
2.1055	Frequency Stability for Temperature & Voltage	Pass	
90.691			

## 2.2. List of test Equipment

Conducted /CTR

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Spectrum Analyzer	Agilent	N9010A	MY52220597	2016/02/18
Directional coupler	Agilent	87300C	MY44300353	2016/11/04
Directional coupler	Agilent	778D-012	50550	2016/11/08
Standard Temperature & Humidity Chamber	WIT	TH-1S-B	EQ-201-00146	2016/11/28
DC power supply	Agilent	E3610A	MY40009845	2016/07/14
Communication Tester	Agilent	8820C	6201465467	2016/06/21

Radiated / Site3

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Bilog Antenna	Schaffner Chase	CBL6112B	2707	2016/06/11
Horn Antenna	R&S	9120D	576	2016/11/24
Pre-Amplifier	Agilent	87405C	MY47010653	2016/08/11
Spectrum Analyzer	Agilent	N9010A	MY52220597	2016/02/18
DC power supply	Agilent	E3610A	MY40009845	2016/07/14
Communication Tester	Agilent	8820C	6201465467	2016/06/21

## 2.3. Measurement Uncertainty

### Conducted Emission

The measurement uncertainty of confidence of 95% is evaluated as  $\pm 1.52$  dB

### Radiated Emission (Below 1GHz)

The measurement uncertainty of confidence of 95% is evaluated as  $\pm 3.44$  dB .

### Radiated Emission (Above 1GHz)

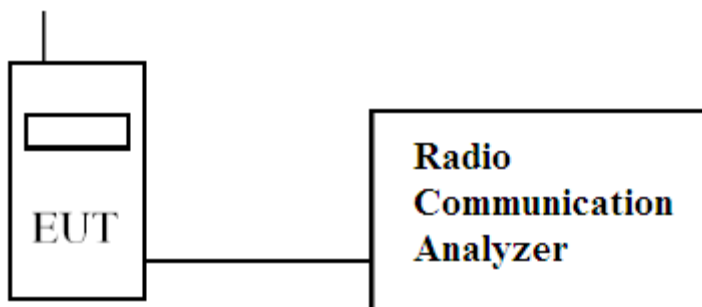
The measurement uncertainty of confidence of 95% is evaluated as  $\pm 4.08$  dB

### 3. Conducted Output Power Measurement

#### 3.1. Test Specification

According to FCC Part 2.1046, 90.635

#### 3.2. Test Setup



#### 3.3. Limits

Band	Limit
LTE Band 26/850	<7W

#### 3.4. Test Procedure

The EUT is tested with maximum rated TX power via the Base Station simulator, and the output power was measured at the antenna terminals of the EUT.

**3.5. Test Result of Maximum Power Output**

Band	Frequency Channel	Modulation	RB No.	RB Offset	MPR	Max Power (dBm)	Max Power (W)
Band 26 (850MHz)/1.4MHz	814.7MHz CH26697	QPSK	1	#0	0	22.37	0.173
			1	#Mid	0	22.53	0.179
			1	#Max	0	<b>22.62</b>	<b>0.183</b>
			50%	#0	1	22.40	0.174
			50%	#Mid	1	22.58	0.181
			50%	#Max	1	22.58	0.181
			100%	--	1	21.53	0.142
		16QAM	1	#0	1	21.62	0.145
			1	#Mid	1	21.83	0.152
			1	#Max	1	<b>21.91</b>	<b>0.155</b>
			50%	#0	2	21.45	0.140
			50%	#Mid	2	21.60	0.145
			50%	#Max	2	21.62	0.145
			100%	--	2	20.62	0.115
	819MHz CH26740	QPSK	1	#0	0	<b>22.81</b>	<b>0.191</b>
			1	#Mid	0	22.76	0.189
			1	#Max	0	22.71	0.187
			50%	#0	1	22.76	0.189
			50%	#Mid	1	22.76	0.189
			50%	#Max	1	22.74	0.188
			100%	--	1	21.60	0.145
		16QAM	1	#0	1	<b>22.16</b>	<b>0.164</b>
			1	#Mid	1	22.00	0.158
			1	#Max	1	22.09	0.162
			50%	#0	2	21.78	0.151
			50%	#Mid	2	21.81	0.152
			50%	#Max	2	21.68	0.147
			100%	--	2	20.73	0.118
	823.3MHz CH26783	QPSK	1	#0	0	<b>22.86</b>	<b>0.193</b>
			1	#Mid	0	22.83	0.192
			1	#Max	0	22.71	0.187
			50%	#0	1	22.70	0.186
			50%	#Mid	1	22.78	0.190
			50%	#Max	1	22.75	0.188
			100%	--	1	21.69	0.148
		16QAM	1	#0	1	<b>22.11</b>	<b>0.163</b>
1			#Mid	1	22.10	0.162	
1			#Max	1	22.06	0.161	
50%			#0	2	21.80	0.151	
50%			#Mid	2	21.87	0.154	
50%			#Max	2	21.78	0.151	
100%			--	2	20.78	0.120	

Band	Frequency Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 26 (850MHz)/3MHz	815.5MHz CH26705	QPSK	1	#0	0	22.44	0.175
			1	#Mid	0	22.89	0.195
			1	#Max	0	<b>22.95</b>	<b>0.197</b>
			50%	#0	1	21.68	0.147
			50%	#Mid	1	21.92	0.156
			50%	#Max	1	21.95	0.157
			100%	--	1	21.89	0.155
		16QAM	1	#0	1	21.69	0.148
			1	#Mid	1	22.09	0.162
			1	#Max	1	<b>22.31</b>	<b>0.170</b>
			50%	#0	2	20.72	0.118
			50%	#Mid	2	20.97	0.125
			50%	#Max	2	21.03	0.127
			100%	--	2	20.89	0.123
	819MHz CH26740	QPSK	1	#0	0	22.95	0.197
			1	#Mid	0	<b>23.32</b>	<b>0.215</b>
			1	#Max	0	22.85	0.193
			50%	#0	1	21.90	0.155
			50%	#Mid	1	21.98	0.158
			50%	#Max	1	21.87	0.154
			100%	--	1	21.98	0.158
		16QAM	1	#0	1	22.21	0.166
			1	#Mid	1	<b>22.38</b>	<b>0.173</b>
			1	#Max	1	22.21	0.166
			50%	#0	2	20.98	0.125
			50%	#Mid	2	21.03	0.127
			50%	#Max	2	20.87	0.122
			100%	--	2	20.93	0.124
	822.5MHz CH26775	QPSK	1	#0	0	22.82	0.191
			1	#Mid	0	<b>23.04</b>	<b>0.201</b>
1			#Max	0	22.67	0.185	
50%			#0	1	21.75	0.150	
50%			#Mid	1	21.77	0.150	
50%			#Max	1	21.78	0.151	
100%			--	1	21.74	0.149	
16QAM		1	#0	1	22.05	0.160	
		1	#Mid	1	<b>22.18</b>	<b>0.165</b>	
		1	#Max	1	22.00	0.158	
		50%	#0	2	20.79	0.120	
		50%	#Mid	2	20.81	0.121	
		50%	#Max	2	20.79	0.120	
		100%	--	2	20.76	0.119	

Band	Frequency Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 26 (850MHz)/5MHz	816.5MHz CH26715	QPSK	1	#0	0	22.43	0.175
			1	#Mid	0	<b>22.89</b>	<b>0.195</b>
			1	#Max	0	22.87	0.194
			50%	#0	1	21.83	0.152
			50%	#Mid	1	22.04	0.160
			50%	#Max	1	21.81	0.152
			100%	--	1	21.85	0.153
		16QAM	1	#0	1	21.67	0.147
			1	#Mid	1	<b>22.36</b>	<b>0.172</b>
			1	#Max	1	22.25	0.168
			50%	#0	2	20.82	0.121
			50%	#Mid	2	20.99	0.126
			50%	#Max	2	20.75	0.119
			100%	--	2	20.89	0.123
	819MHz CH26740	QPSK	1	#0	0	22.96	0.198
			1	#Mid	0	<b>23.03</b>	<b>0.201</b>
			1	#Max	0	22.87	0.194
			50%	#0	1	21.81	0.152
			50%	#Mid	1	21.96	0.157
			50%	#Max	1	21.89	0.155
			100%	--	1	21.95	0.157
		16QAM	1	#0	1	22.24	0.167
			1	#Mid	1	<b>22.40</b>	<b>0.174</b>
			1	#Max	1	22.19	0.166
			50%	#0	2	20.79	0.120
			50%	#Mid	2	20.92	0.124
			50%	#Max	2	20.87	0.122
			100%	--	2	20.93	0.124
	821.5MHz CH26765	QPSK	1	#0	0	<b>22.94</b>	<b>0.197</b>
			1	#Mid	0	22.86	0.193
			1	#Max	0	22.77	0.189
			50%	#0	1	21.89	0.155
			50%	#Mid	1	21.82	0.152
			50%	#Max	1	21.73	0.149
			100%	--	1	21.84	0.153
		16QAM	1	#0	1	22.11	0.163
1			#Mid	1	<b>22.47</b>	<b>0.177</b>	
1			#Max	1	22.02	0.159	
50%			#0	2	20.88	0.122	
50%			#Mid	2	20.73	0.118	
50%			#Max	2	20.72	0.118	
100%			--	2	20.80	0.120	

Band	Frequency Channel	Modulation	RB No.	RB Offset	MPR	Max Power (Conducted)	Max Power (W)
Band 26 (850MHz)/10MHz	819MHz CH26740	QPSK	1	#0	0	22.48	0.177
			1	#Mid	0	<b>23.14</b>	<b>0.206</b>
			1	#Max	0	22.76	0.189
			50%	#0	1	21.96	0.157
			50%	#Mid	1	21.99	0.158
			50%	#Max	1	21.87	0.154
			100%	--	1	21.97	0.157
		16QAM	1	#0	1	21.71	0.148
			1	#Mid	1	<b>22.34</b>	<b>0.171</b>
			1	#Max	1	22.01	0.159
			50%	#0	2	20.95	0.124
			50%	#Mid	2	20.97	0.125
			50%	#Max	2	20.84	0.121
			100%	--	2	20.87	0.122



**3.6. Maximum Conducted Power and ERP/EIRP Power**

According to KDB 412172 D01 Section 1.2 Power Approach

$$EIRP = P_T + G_T - L_C = ERP + 2.15 \text{ dB}, ERP = EIRP - 2.15 \text{ dB}$$

$P_T$  = transmitter output power in dBm

$G_T$  = gain of the transmitting antenna in dBi

$L_C$  = signal attenuation in the connecting cable between the transmitter and antenna in dB

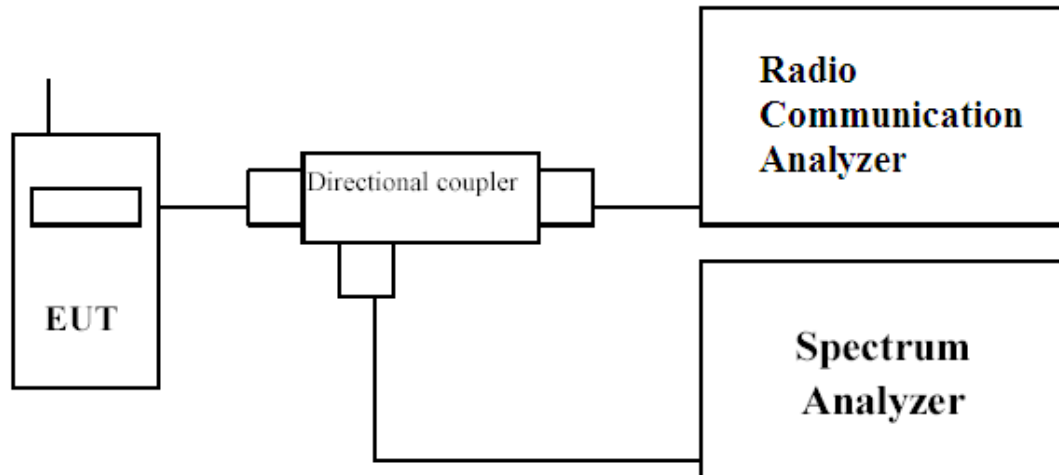
LTE Band	BW	Modulation	Conducted Peak Power (dBm)	Conducted Peak Power (W)	Antenna Gain (dBi)	Maximum ERP/EIRP (W)	Maximum ERP/EIRP Limit (W)
26	1.4M	QPSK	22.86	0.193	0.71	0.139	7
		16QAM	22.16	0.164	0.71	0.118	7
	3M	QPSK	23.32	0.215	0.71	0.154	7
		16QAM	22.38	0.173	0.71	0.124	7
	5M	QPSK	23.03	0.201	0.71	0.144	7
		16QAM	22.47	0.177	0.71	0.127	7
	10M	QPSK	23.14	0.206	0.71	0.148	7
		16QAM	22.34	0.171	0.71	0.123	7

## 4. Occupied Bandwidth

### 4.1. Test Secification

According to FCC Part 2.1049, 90.209

### 4.2. Test Setup



### 4.3. Test Procedure

The EUT is tested with maximum rated TX power via the Base Station simulator, and the occupied bandwidth was measured at the antenna terminals of the EUT.

The Resolution BW of the analyzer is set to 1 %~5% of the emission bandwidth. The EUT's occupied bandwidth is measured as the width of the signal between two points, one below the carrier center frequency and one above the carrier frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.

The plots below show the resultant display from the Spectrum Analyser.

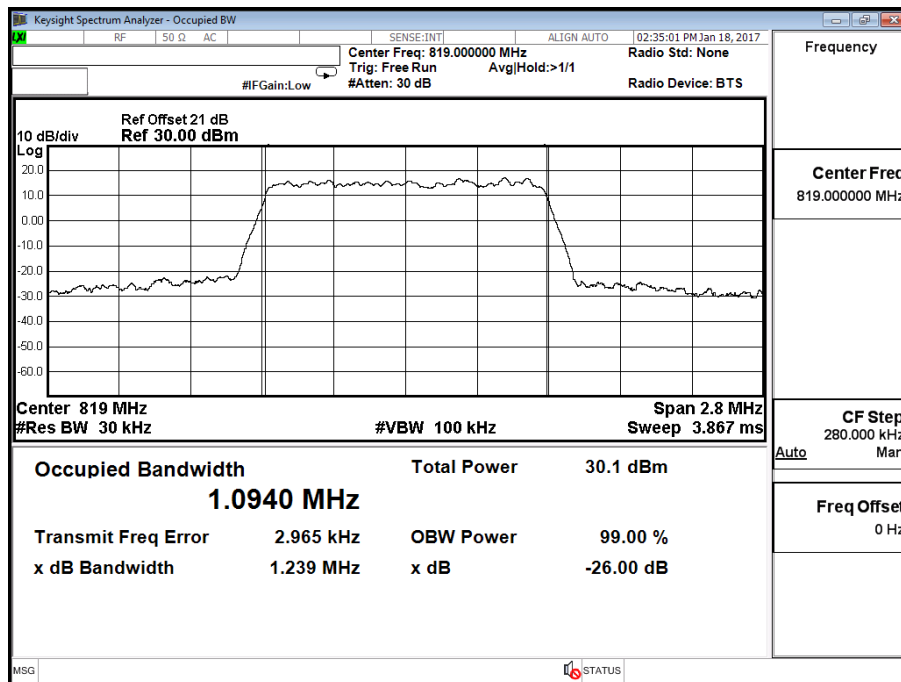
#### 4.4. Test Result of Occupied Bandwidth

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager
Test Mode	Occupied Bandwidth
Test Site	CTR

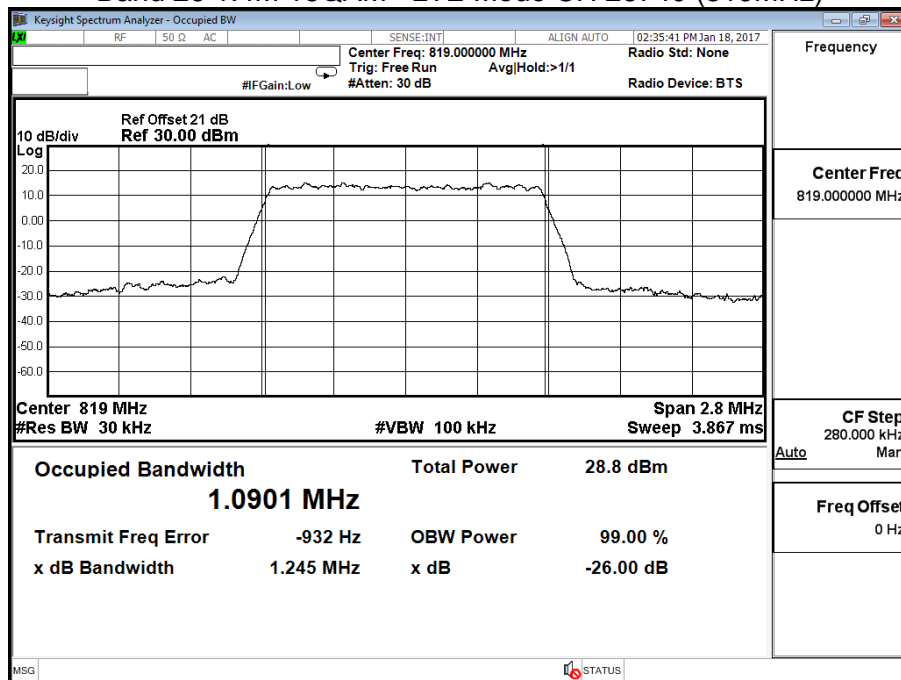
Test Mode	Channel	TX Frequency (MHz)	99% Occupied Bandwidth (MHz)	26 dB bandwidth (MHz)	Result
Band 26 1.4M QPSK	26740	819	1.0940	1.239	Pass
Band 26 1.4M 16QAM	26740	819	1.0901	1.245	Pass
Band 26 3M QPSK	26740	819	2.7371	3.098	Pass
Band 26 3M 16QAM	26740	819	2.7292	3.072	Pass
Band 26 5M QPSK	26740	819	4.5113	4.954	Pass
Band 26 5M 16QAM	26740	819	4.4848	4.922	Pass
Band 26 10M QPSK	26740	819	9.0432	9.930	Pass
Band 26 10M 16QAM	26740	819	9.0295	9.957	Pass

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Occupied Bandwidth		
Date of Test	2017/01/17	Test Site	CTR
Test Condition	Band 26 1.4M		

Band 26 1.4M QPSK - LTE Mode CH 26740 (819MHz)

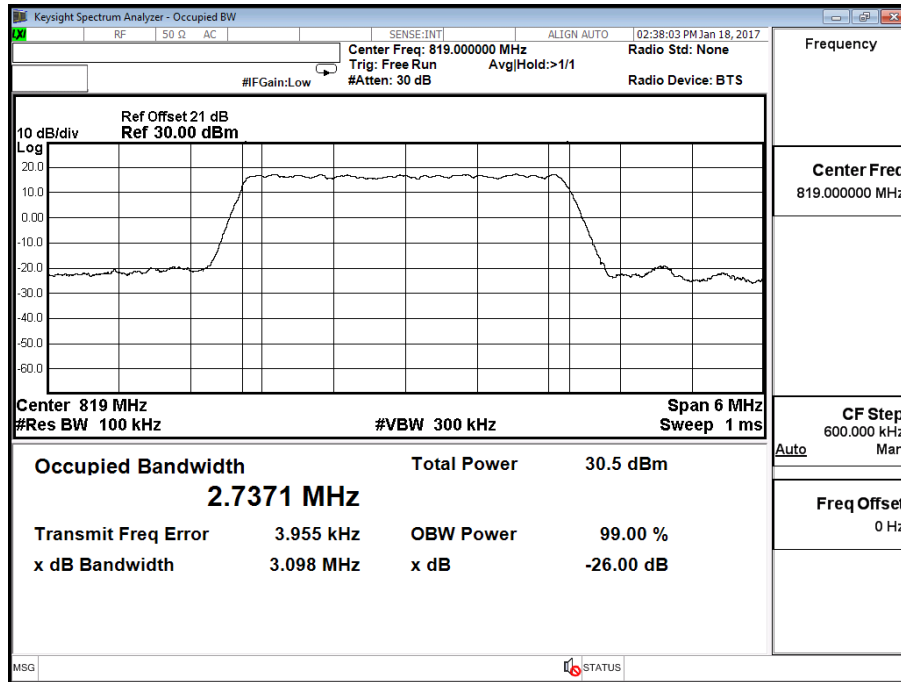


Band 26 1.4M 16QAM - LTE Mode CH 26740 (819MHz)

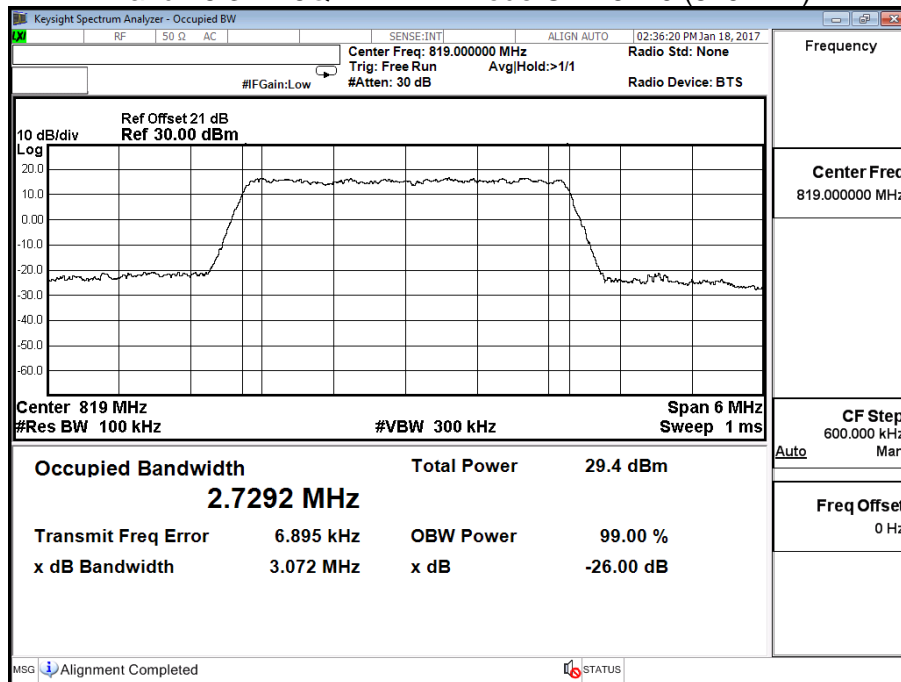


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Occupied Bandwidth		
Date of Test	2017/01/17	Test Site	CTR
Test Condition	Band 26 3M		

Band 26 3M QPSK - LTE Mode CH 26740 (819MHz)

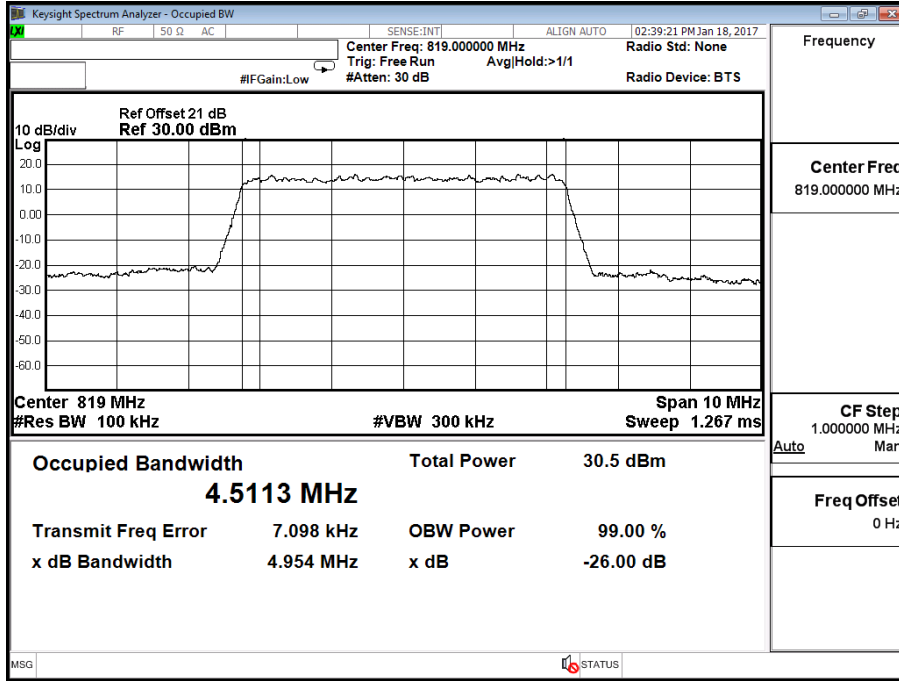


Band 26 3M 16QAM - LTE Mode CH 26740 (819MHz)

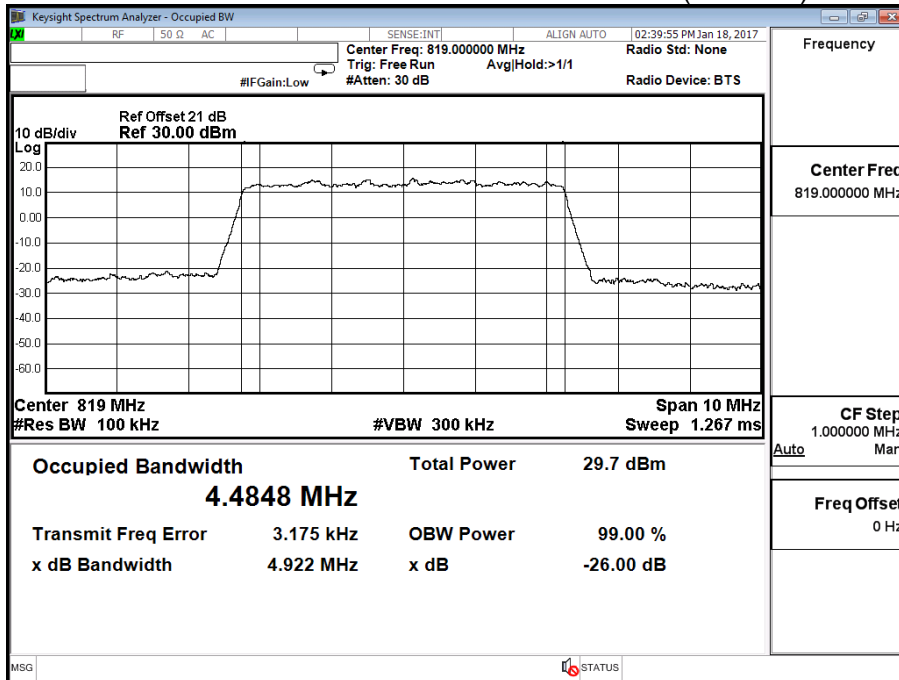


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Occupied Bandwidth		
Date of Test	2017/01/17	Test Site	CTR
Test Condition	Band 26 5M		

Band 26 5M QPSK - LTE Mode CH 26740 (819MHz)

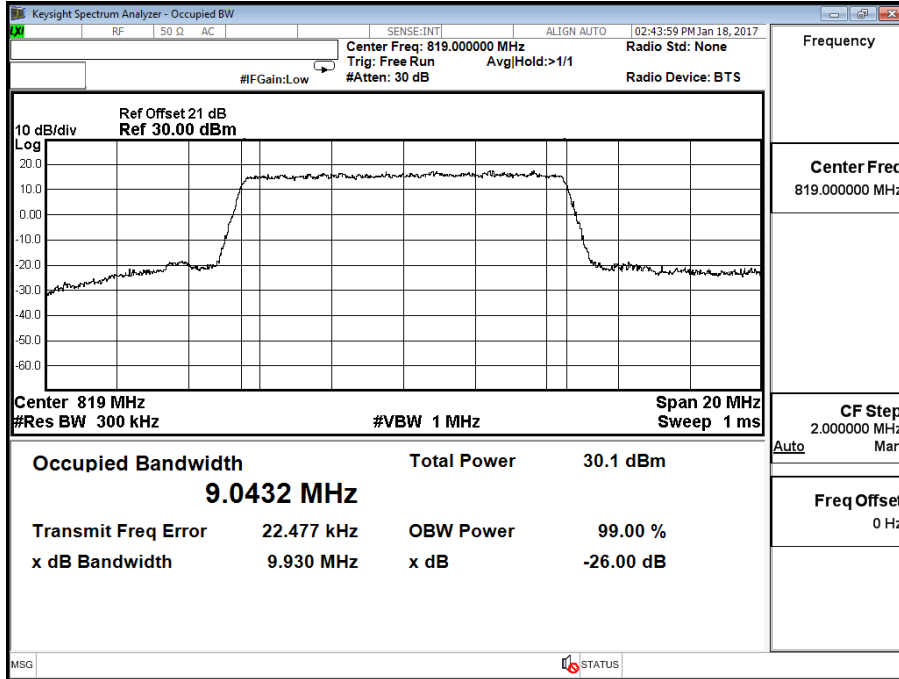


Band 26 5M 16QAM - LTE Mode CH 26740 (819MHz)

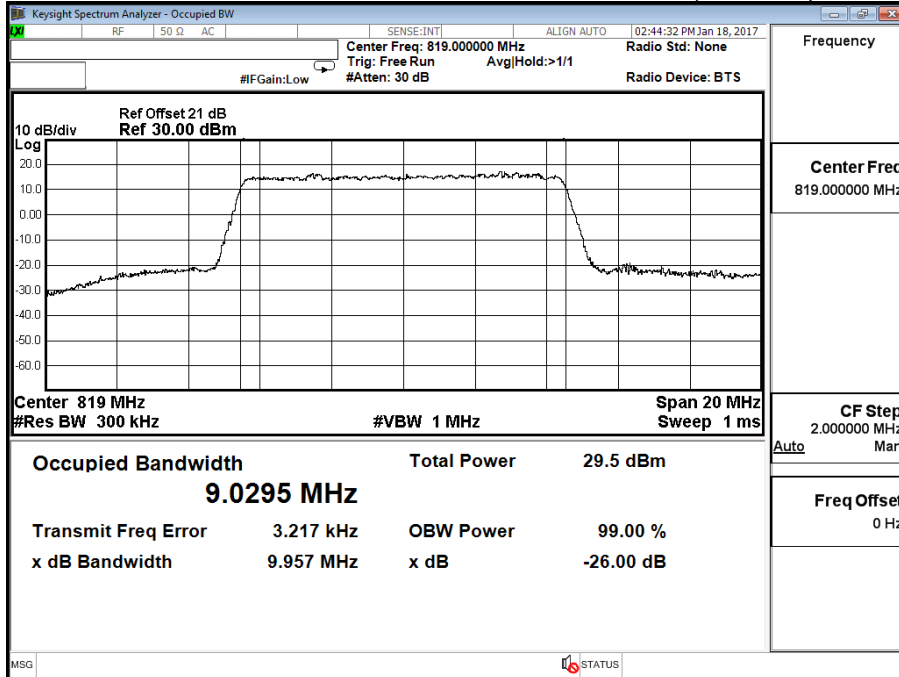


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Occupied Bandwidth		
Date of Test	2017/01/17	Test Site	CTR
Test Condition	Band 26 10M		

Band 26 10M QPSK - LTE Mode CH 26740 (819MHz)



Band 26 10M 16QAM - LTE Mode CH 26740 (819MHz)

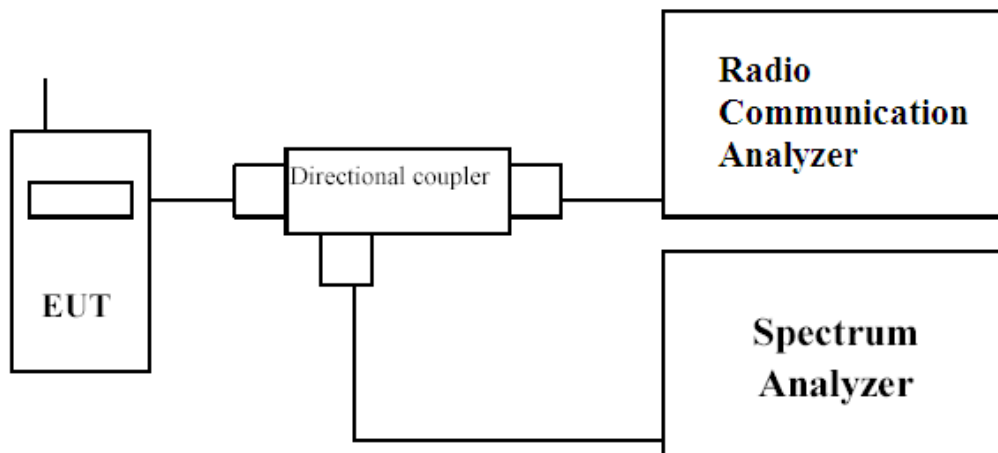


## 5. Spurious Emission At Antenna Terminals (+/-1MHz)

### 5.1. Test Specification

According to Part 2.1051, 90.691

### 5.2. Setup



### 5.3. Limits

(1) For any frequency removed from the EA licensee's frequency block by up to and including 37.5 kHz, the power of any emission shall be attenuated below the transmitter power ( $P$ ) in watts by at least  $116 \text{ Log}_{10}(f/6.1)$  decibels or  $50 + 10 \text{ log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where  $f$  is the frequency removed from the center of the outer channel in the block in kilohertz and where  $f$  is greater than 12.5 kHz.

(2) For any frequency removed from the EA licensee's frequency block greater than 37.5 kHz, the power of any emission shall be attenuated below the transmitter power ( $P$ ) in watts by at least  $43 + 10 \text{ log}_{10}(P)$  decibels or 80 decibels, whichever is the lesser attenuation, where  $f$  is the frequency removed from the center of the outer channel in the block in kilohertz and where  $f$  is greater than 37.5 kHz.

### 5.4. Test Procedure

In accordance with Part 90.691 at least 1% of the emission bandwidth was used for the resolution and video bandwidths up to 1MHz away from the Block Edge. At greater than 1MHz, the resolution and video bandwidth were increased to 1MHz/3MHz.

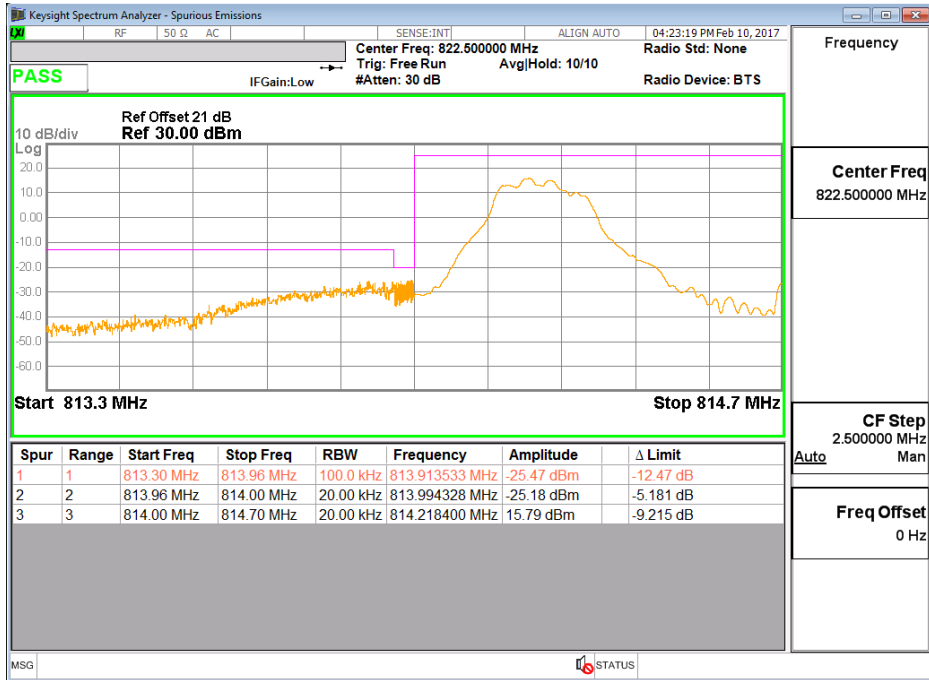
The reference power and path losses of all channels used for testing in each frequency block were measured.



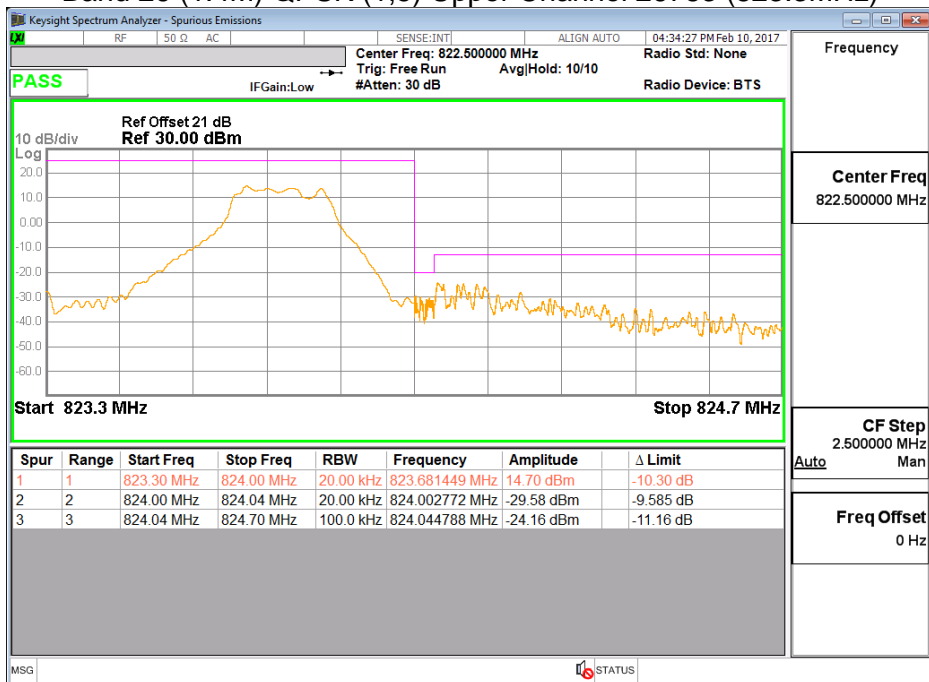
### 5.5. Test Result of Spurious Emission At Antenna Terminals (+/-1MHz)

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2017/02/10	Test Site	CTR
Test Condition	Block Edge Test (Band 26 (1.4M))		

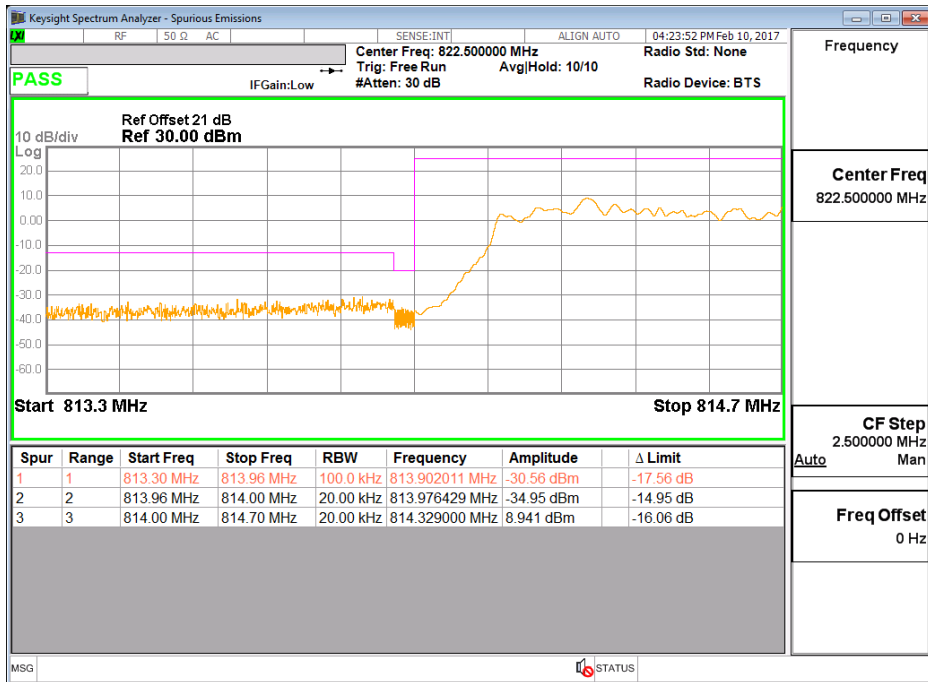
Band 26 (1.4M) QPSK (1,0) Lower Channel 26697 (814.7MHz)



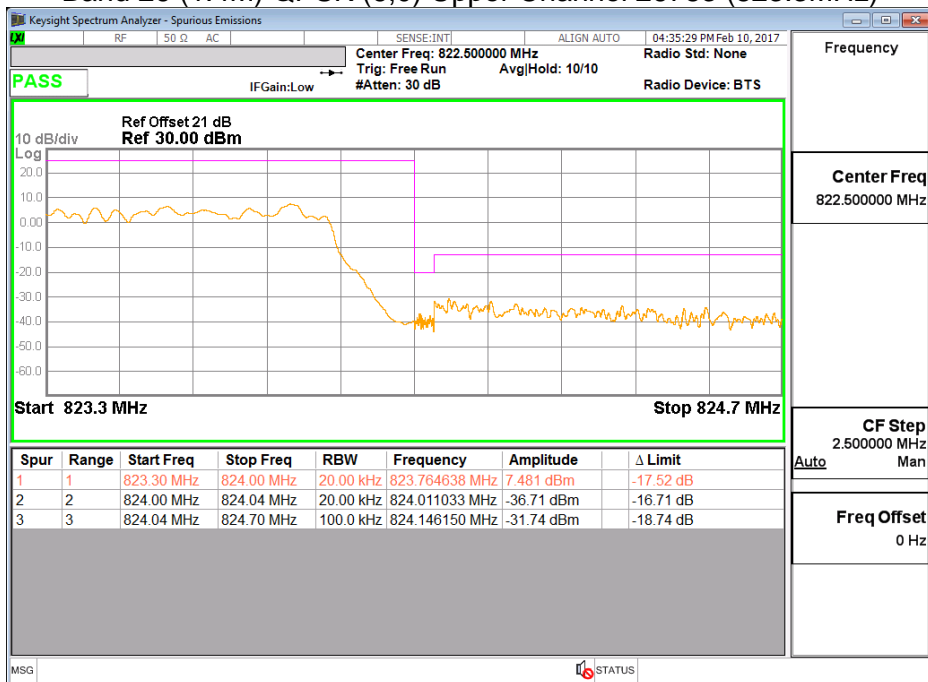
Band 26 (1.4M) QPSK (1,5) Upper Channel 26783 (823.3MHz)



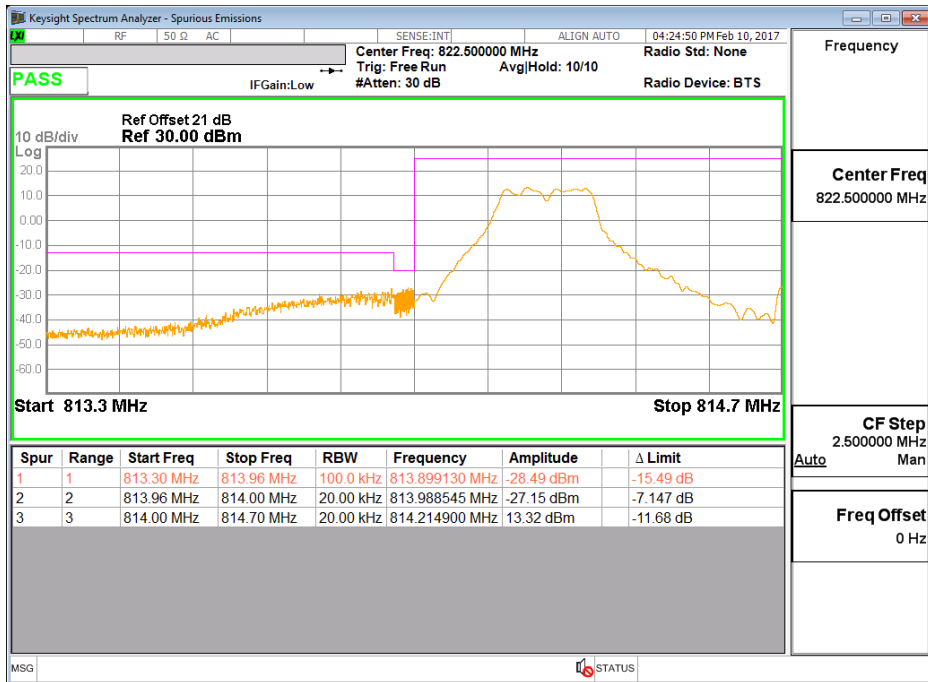
Band 26 (1.4M) QPSK (6,0) Lower Channel 26697 (814.7MHz)



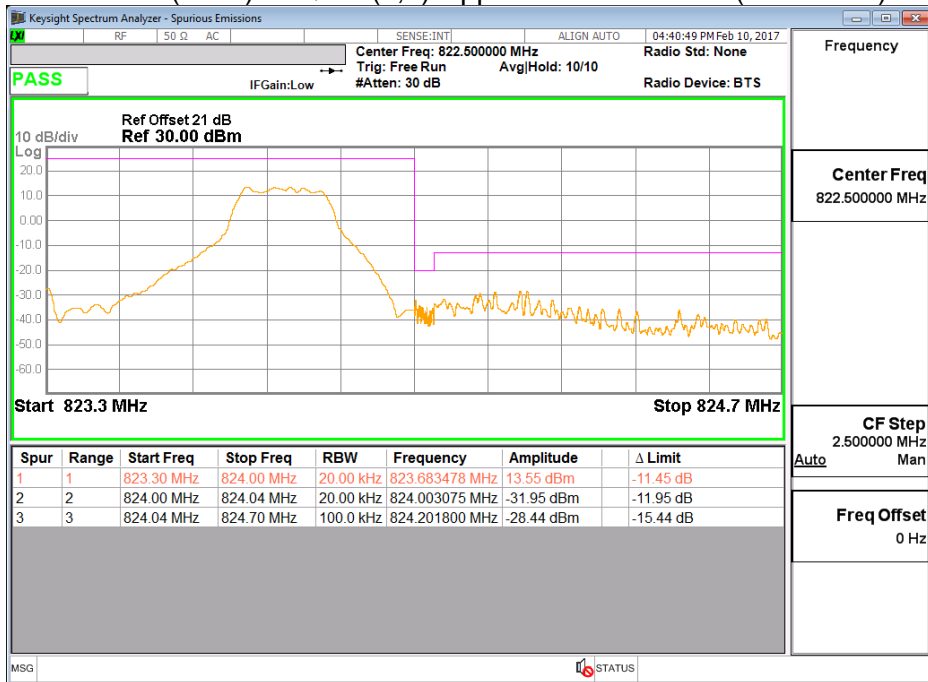
Band 26 (1.4M) QPSK (6,0) Upper Channel 26783 (823.3MHz)



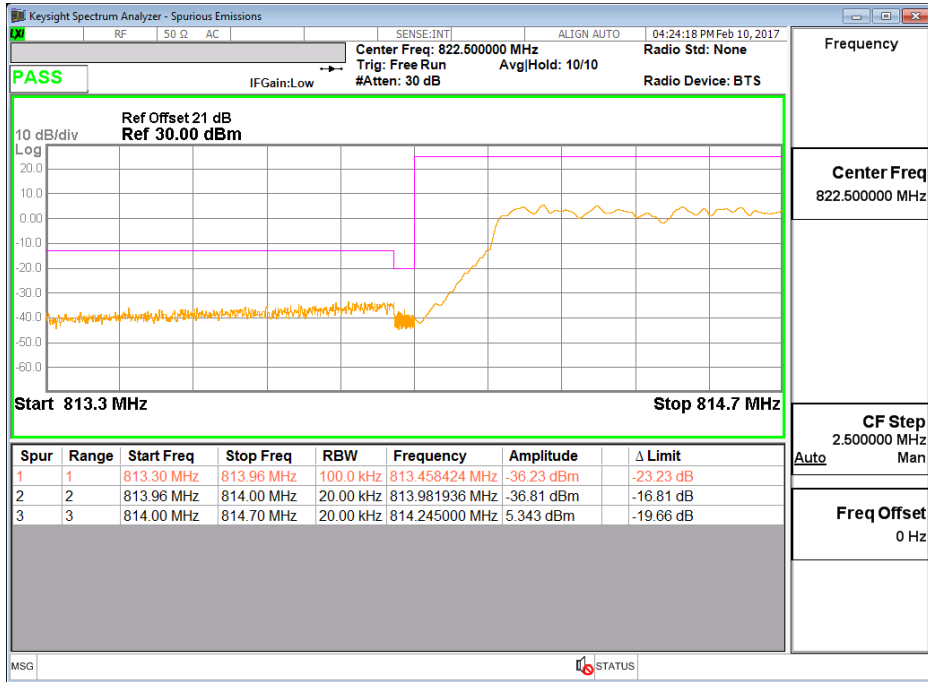
Band 26 (1.4M) 16QAM (1,0) Lower Channel 26697 (814.7MHz)



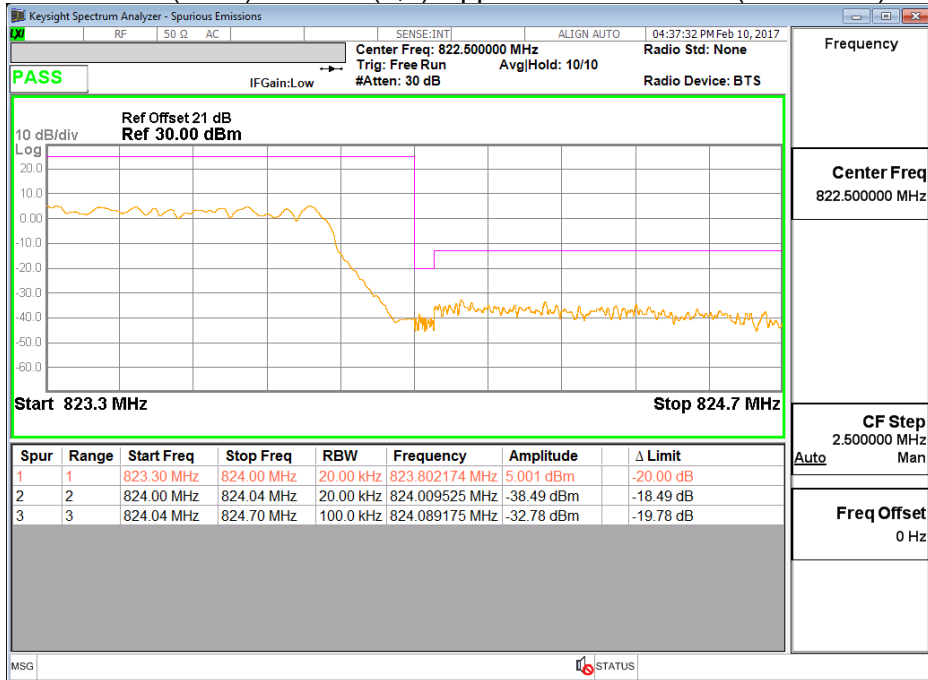
Band 26 (1.4M) 16QAM (1,5) Upper Channel 26783 (823.3MHz)



Band 26 (1.4M) 16QAM (6,0) Lower Channel 26697 (814.7MHz)

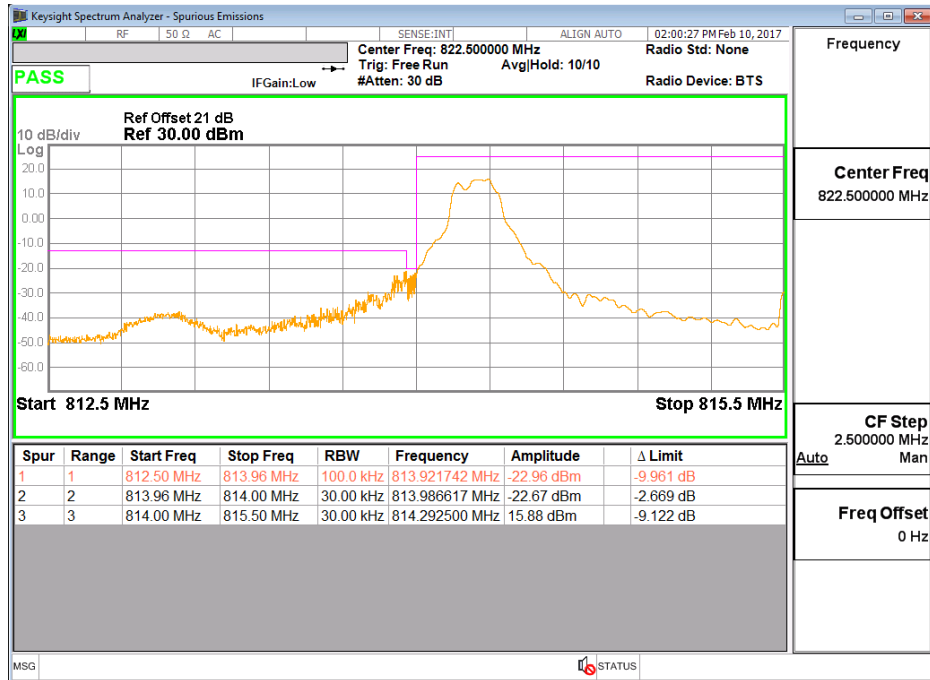


Band 26 (1.4M) 16QAM (6,0) Upper Channel 26783 (823.3MHz)

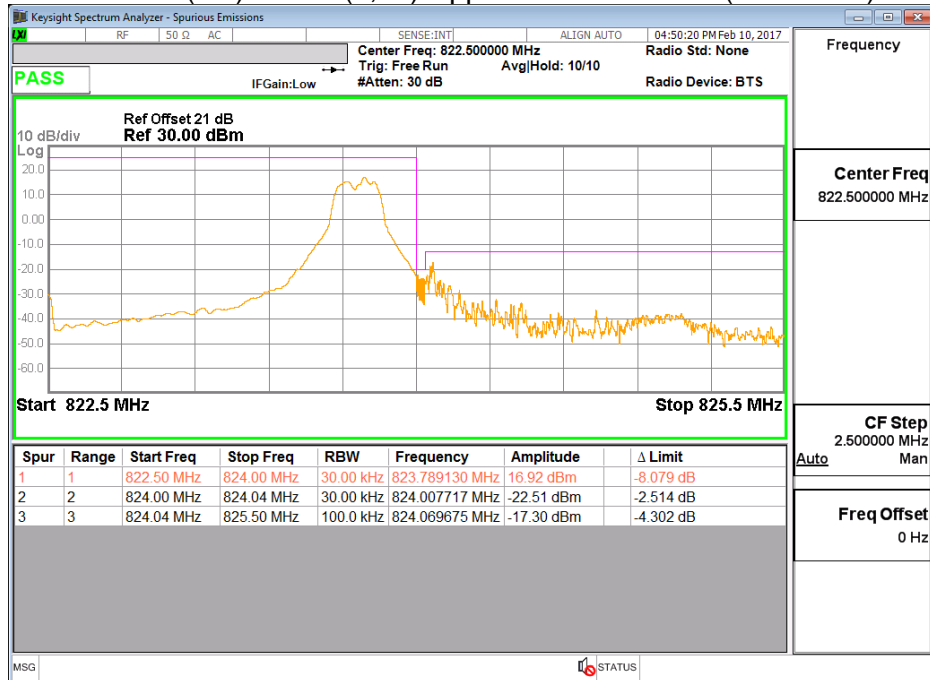


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2017/02/10	Test Site	CTR
Test Condition	Block Edge Test (Band 26 (3M))		

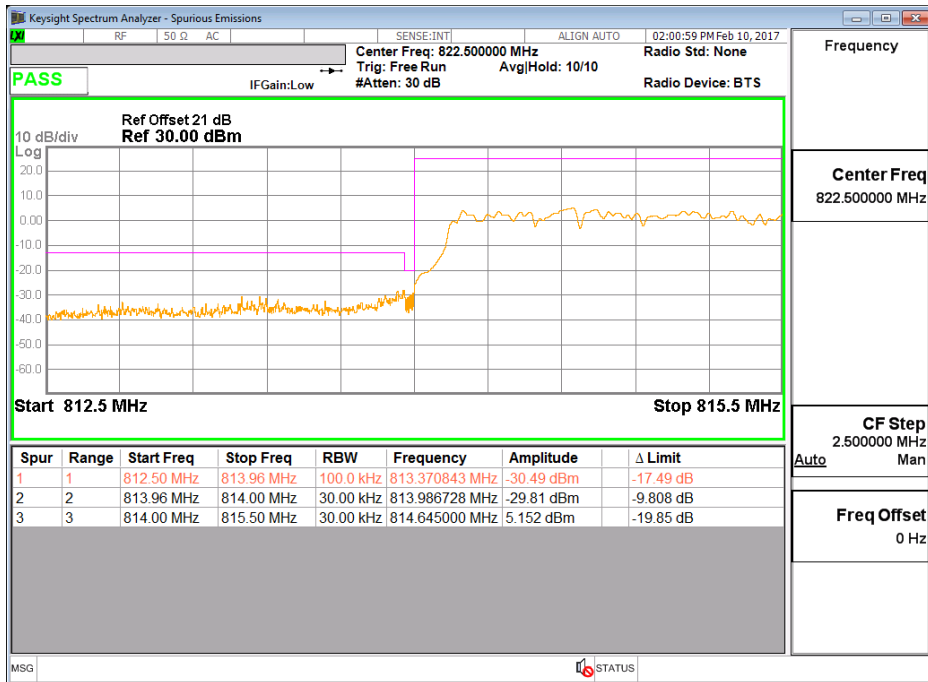
Band 26 (3M) QPSK (1,0) Lower Channel 26705 (815.5MHz)



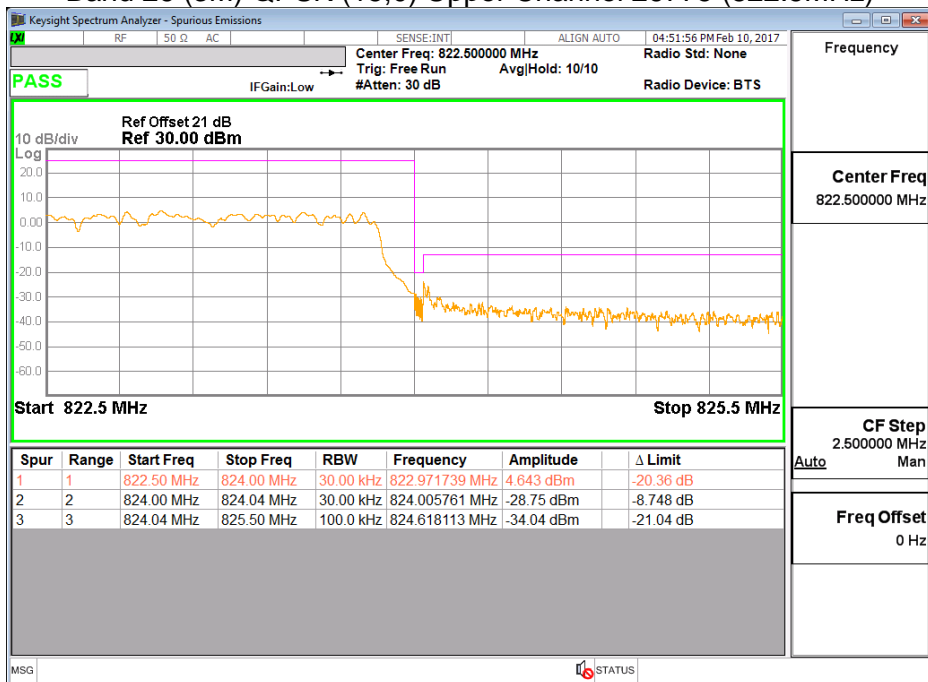
Band 26 (3M) QPSK (1,14) Upper Channel 26775 (822.5MHz)



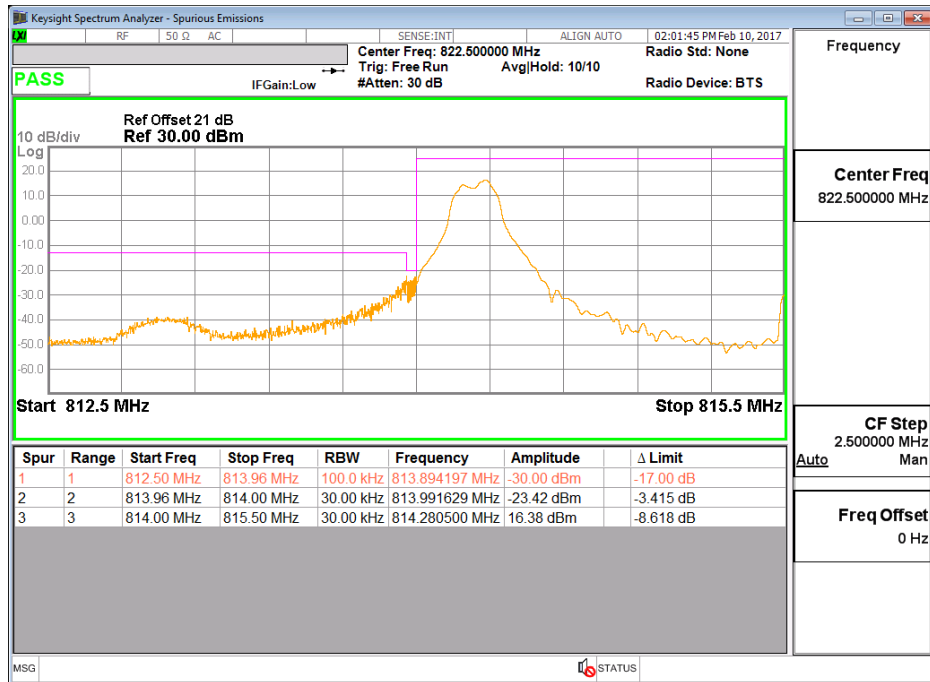
Band 26 (3M) QPSK (15,0) Lower Channel 26705 (815.5MHz)



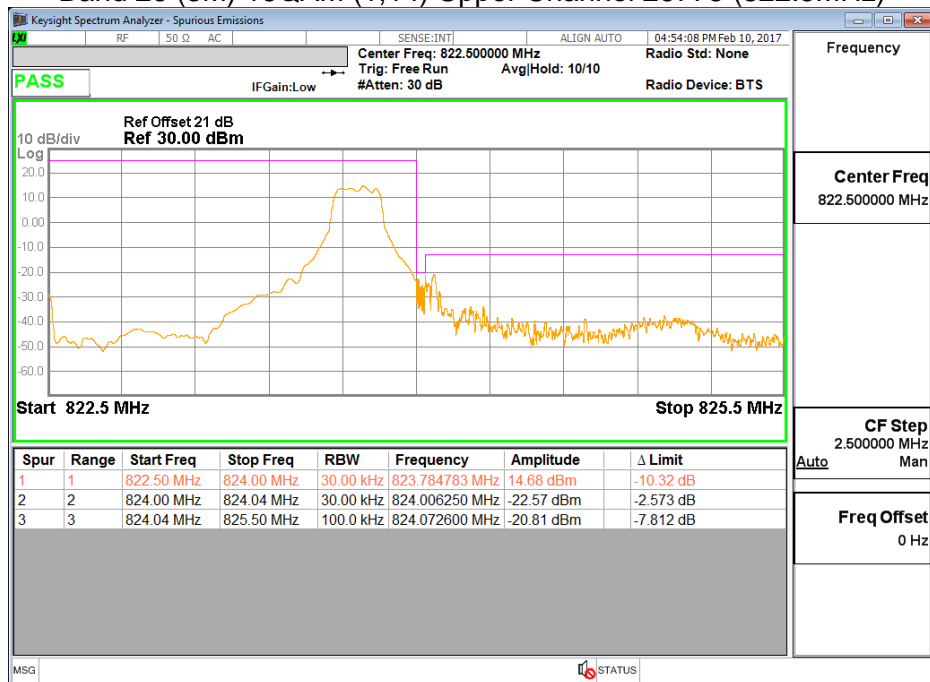
Band 26 (3M) QPSK (15,0) Upper Channel 26775 (822.5MHz)



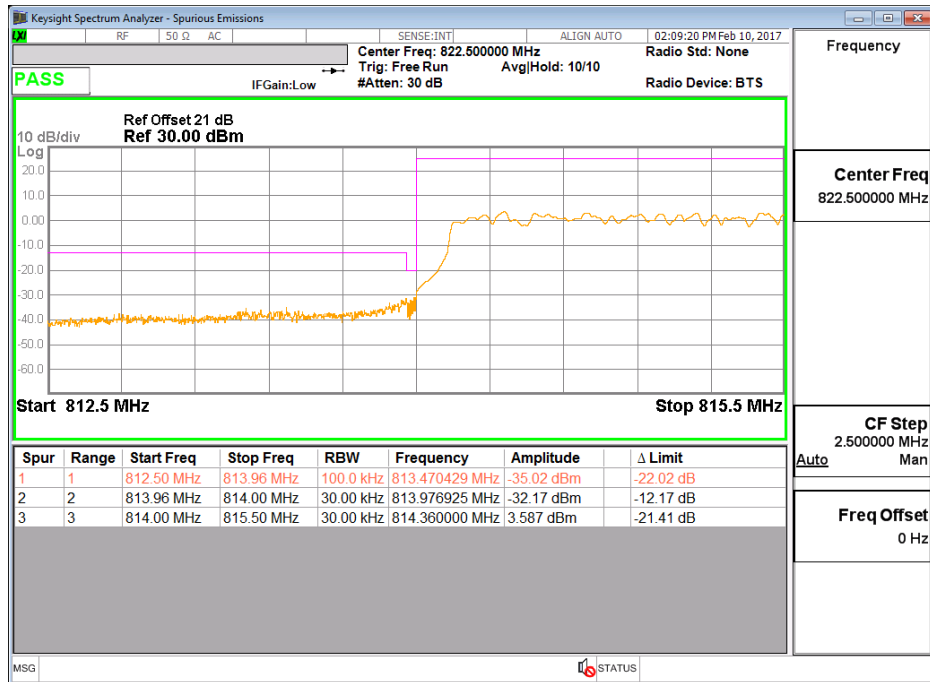
Band 26 (3M) 16QAM (1,0) Lower Channel 26705 (815.5MHz)



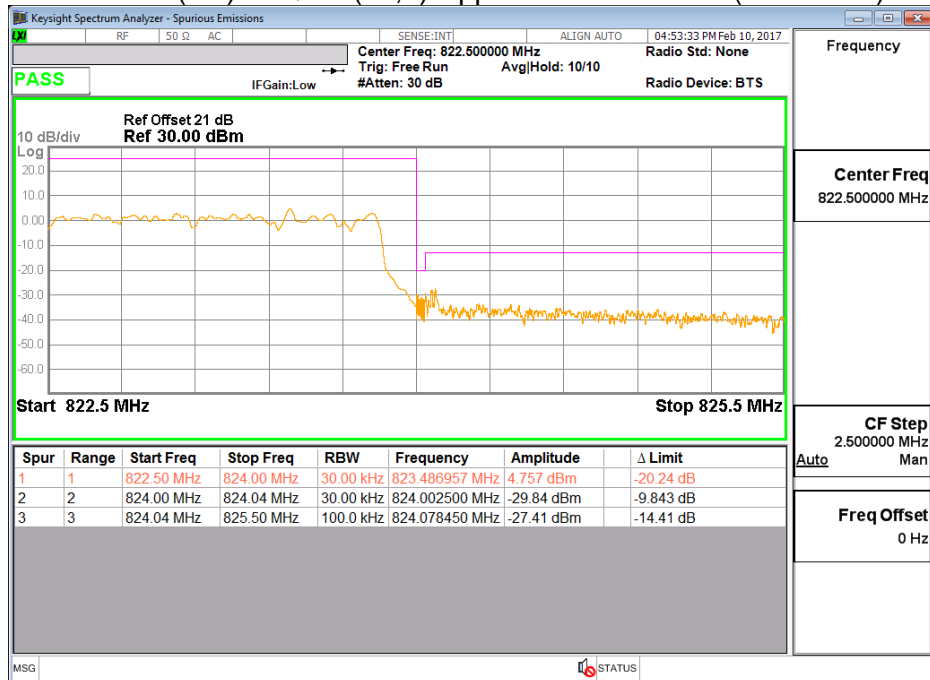
Band 26 (3M) 16QAM (1,14) Upper Channel 26775 (822.5MHz)



Band 26 (3M) 16QAM (15,0) Lower Channel 26705 (815.5MHz)



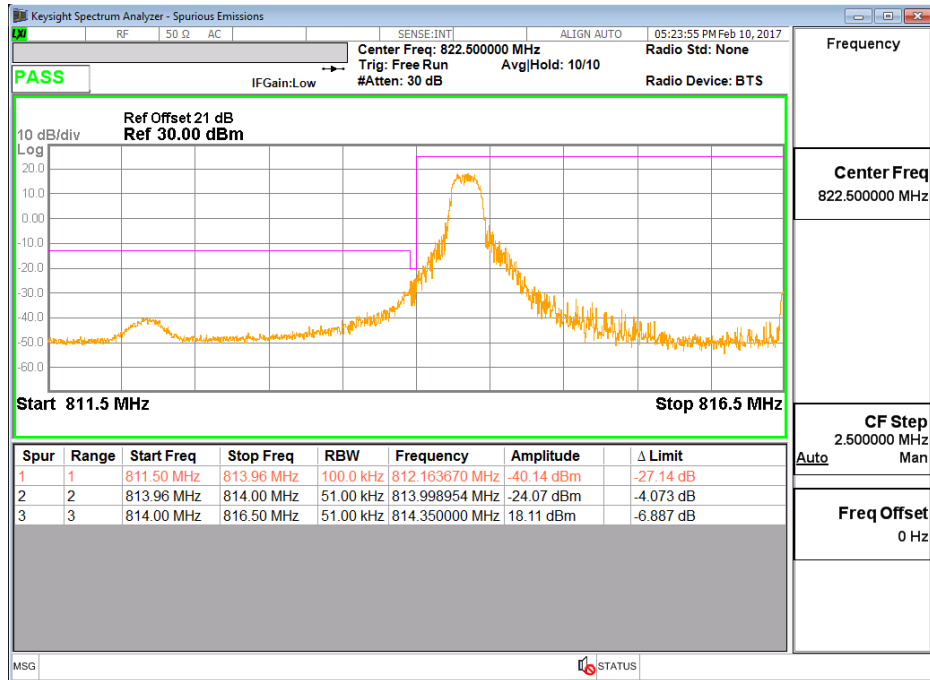
Band 26 (3M) 16QAM (15,0) Upper Channel 26775 (822.5MHz)



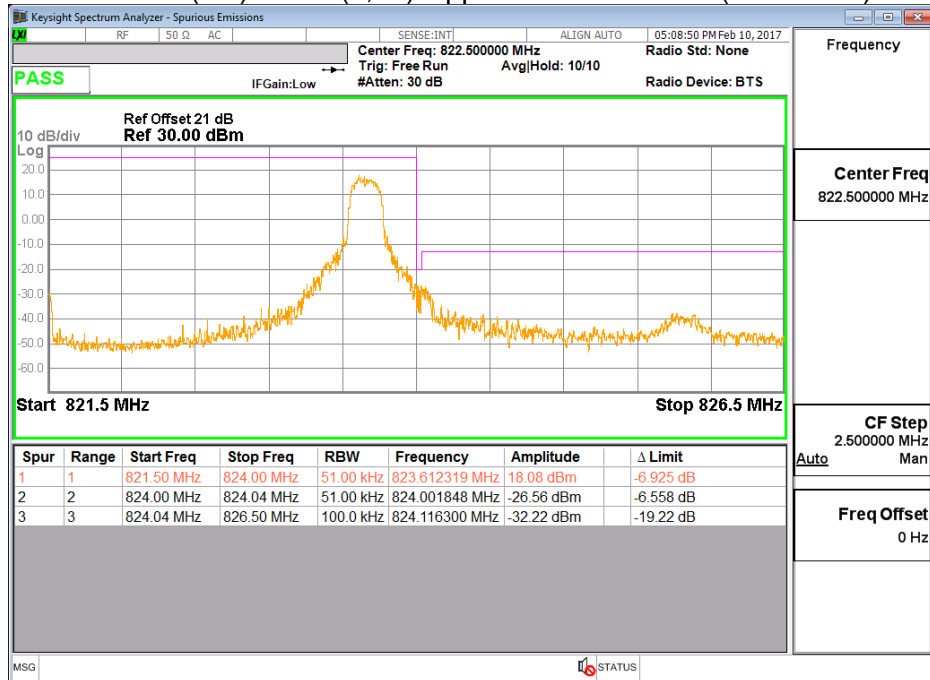


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2017/02/10	Test Site	CTR
Test Condition	Block Edge Test (Band 26 (5M))		

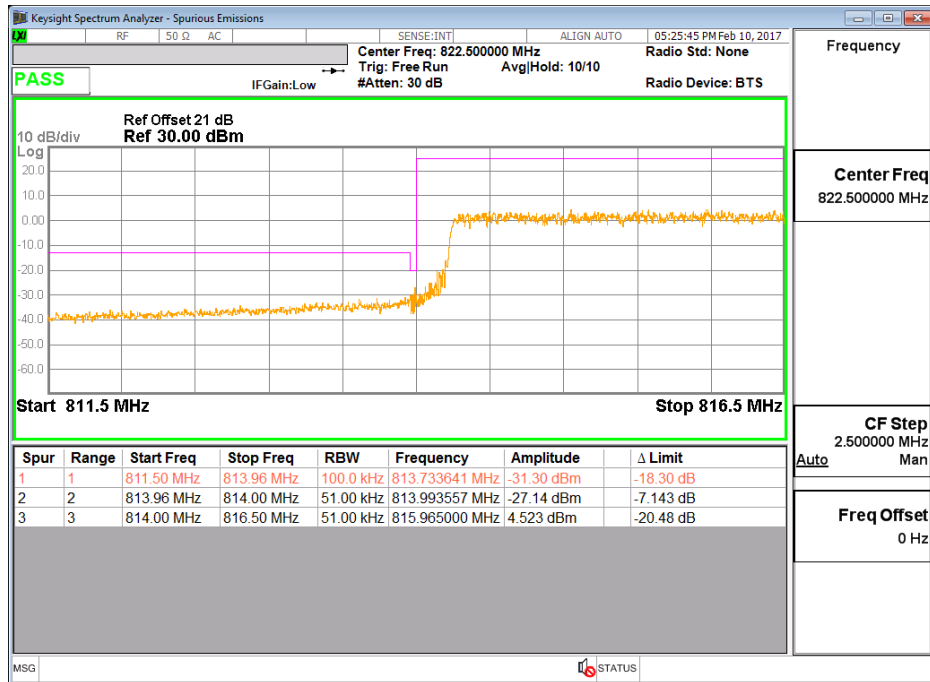
Band 26 (5M) QPSK(1,0) Lower Channel 26715 (816.5MHz)



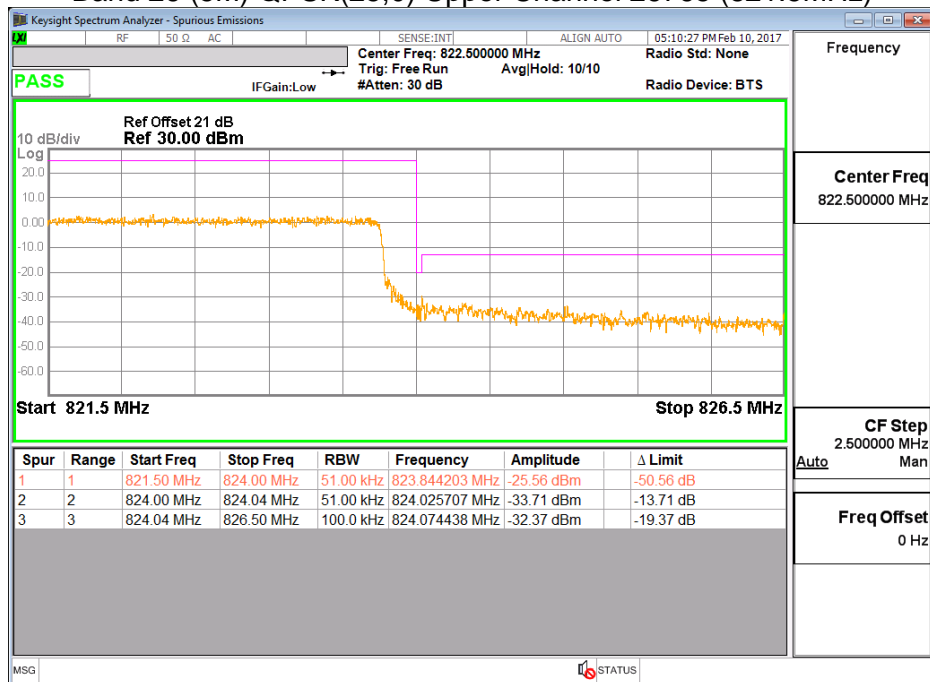
Band 26 (5M) QPSK(1,24) Upper Channel 26765 (821.5MHz)



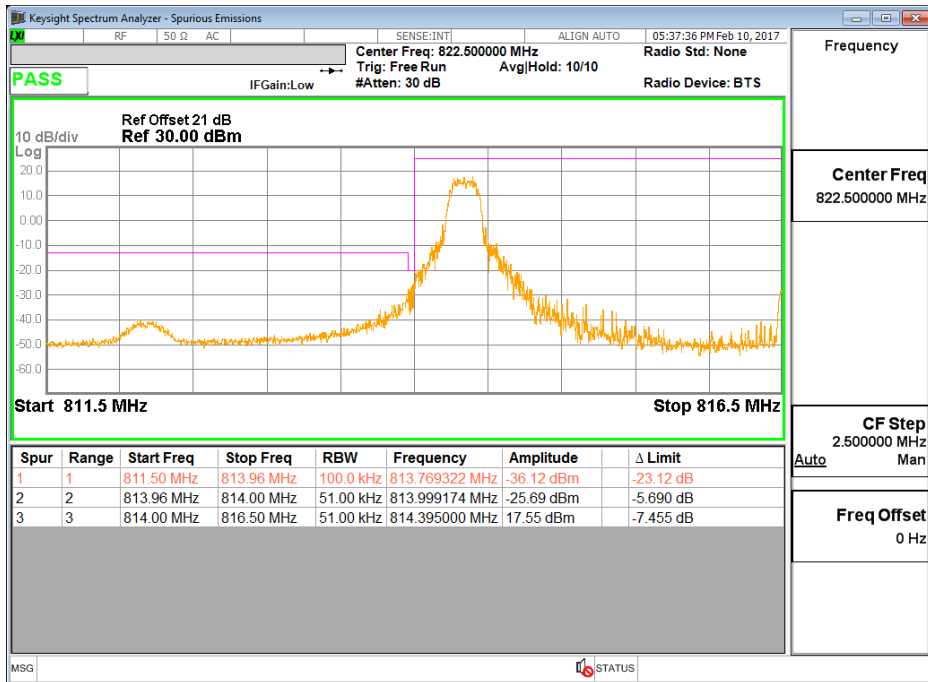
Band 26 (5M) QPSK(25,0) Lower Channel 26715 (816.5MHz)



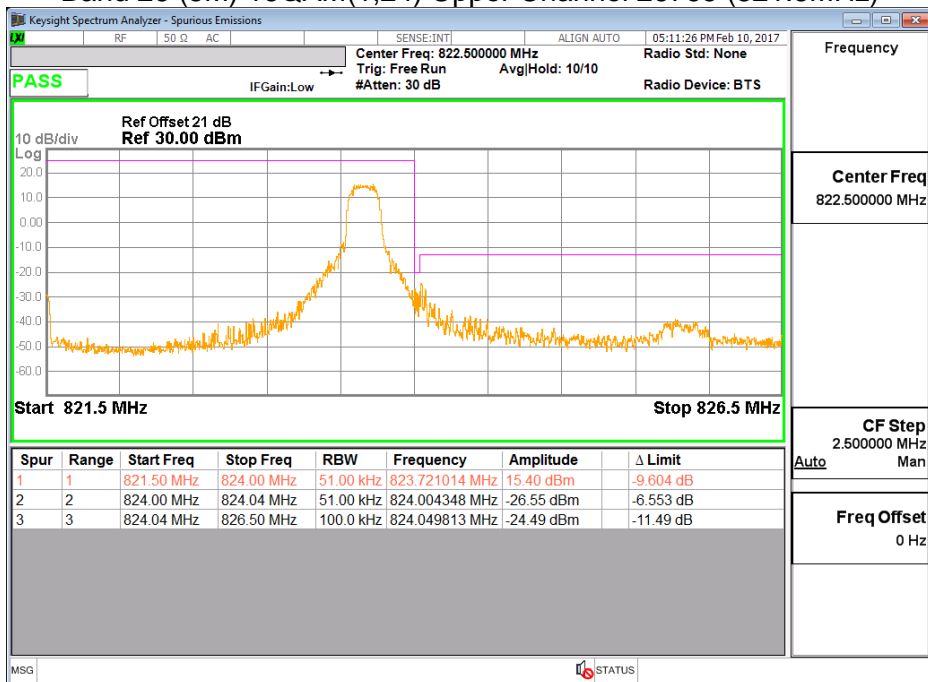
Band 26 (5M) QPSK(25,0) Upper Channel 26765 (821.5MHz)



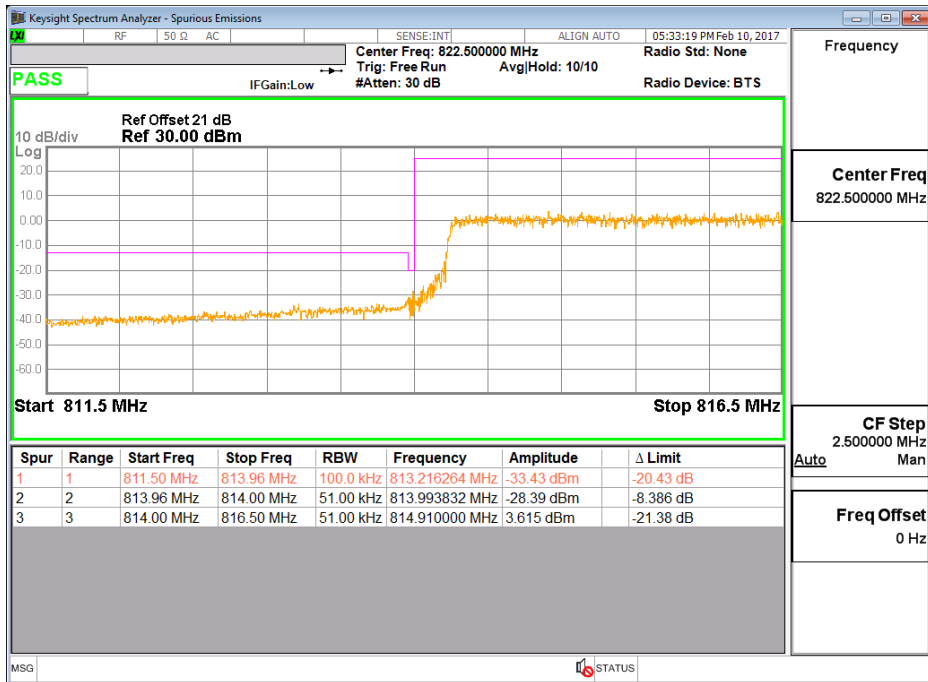
Band 26 (5M) 16QAM(1,0) Lower Channel 26715 (816.5MHz)



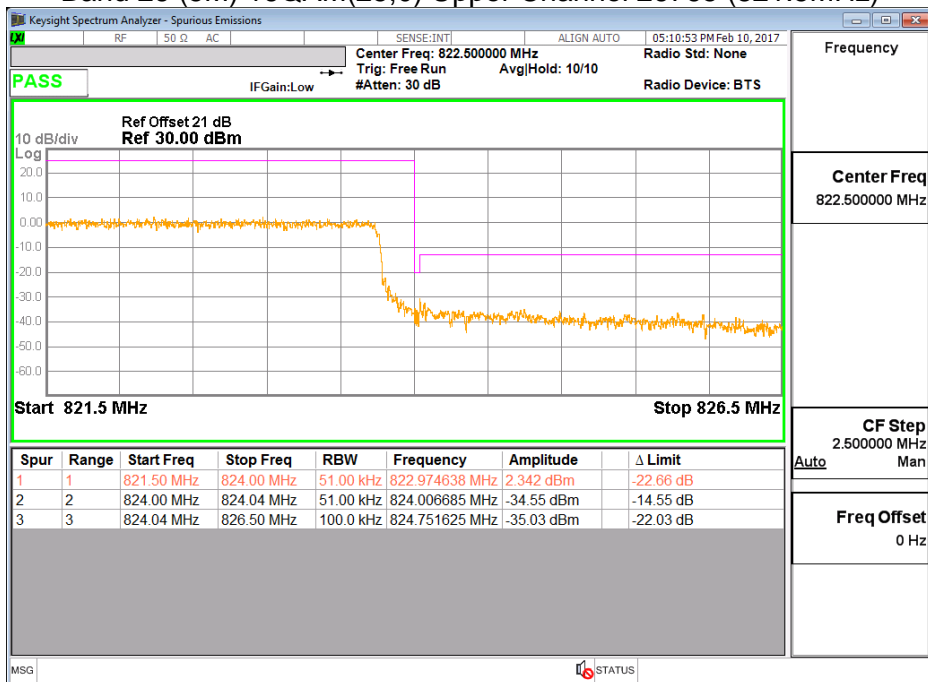
Band 26 (5M) 16QAM(1,24) Upper Channel 26765 (821.5MHz)



Band 26 (5M) 16QAM(25,0) Lower Channel 26715 (816.5MHz)

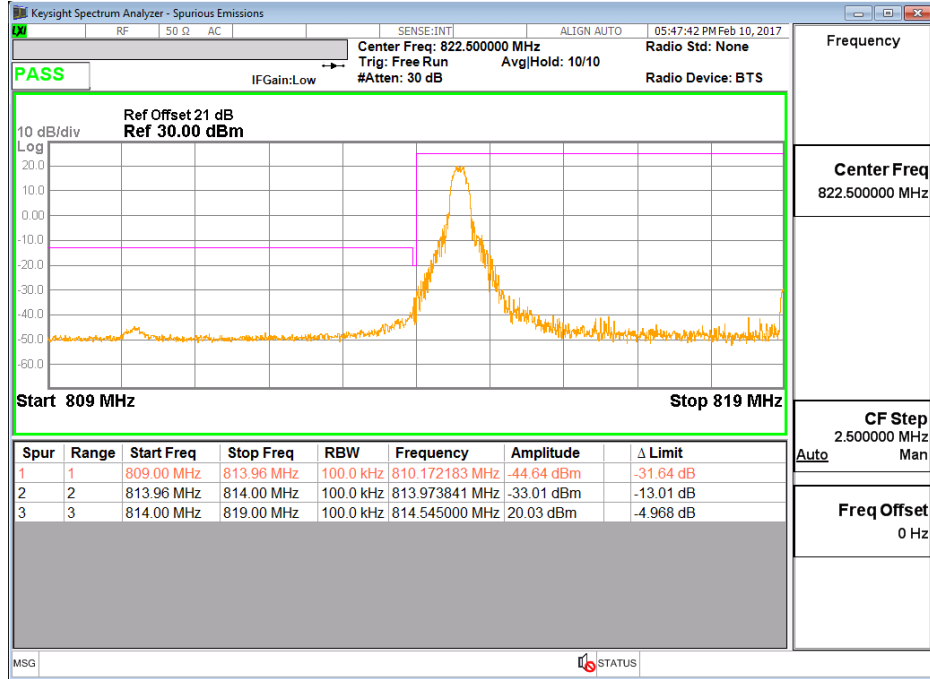


Band 26 (5M) 16QAM(25,0) Upper Channel 26765 (821.5MHz)

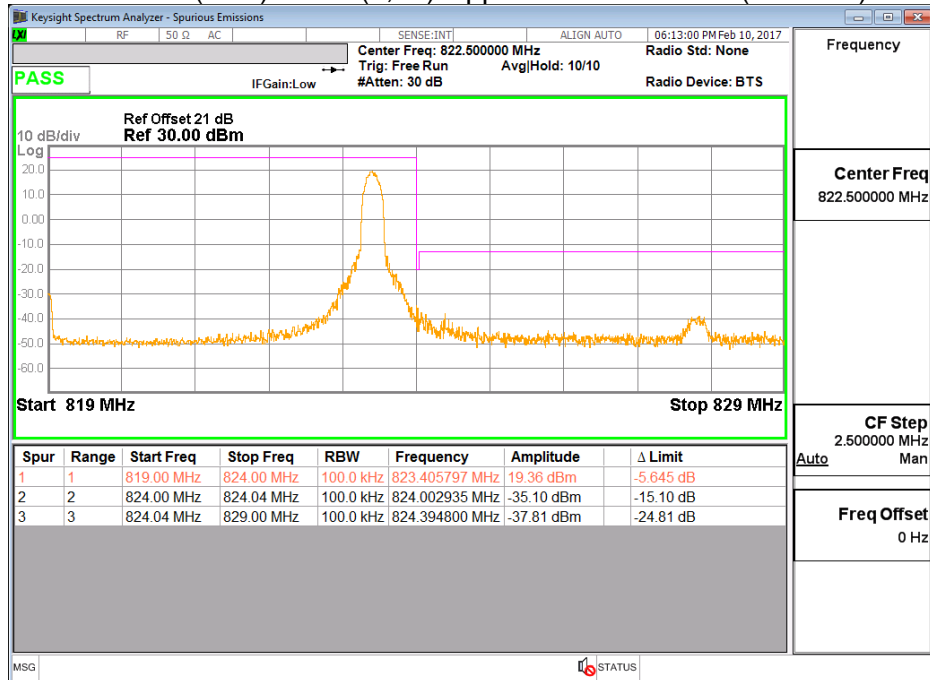


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission At Antenna Terminals (+/-1MHz)		
Date of Test	2017/02/10	Test Site	CTR
Test Condition	Block Edge Test (Band 26 (10M))		

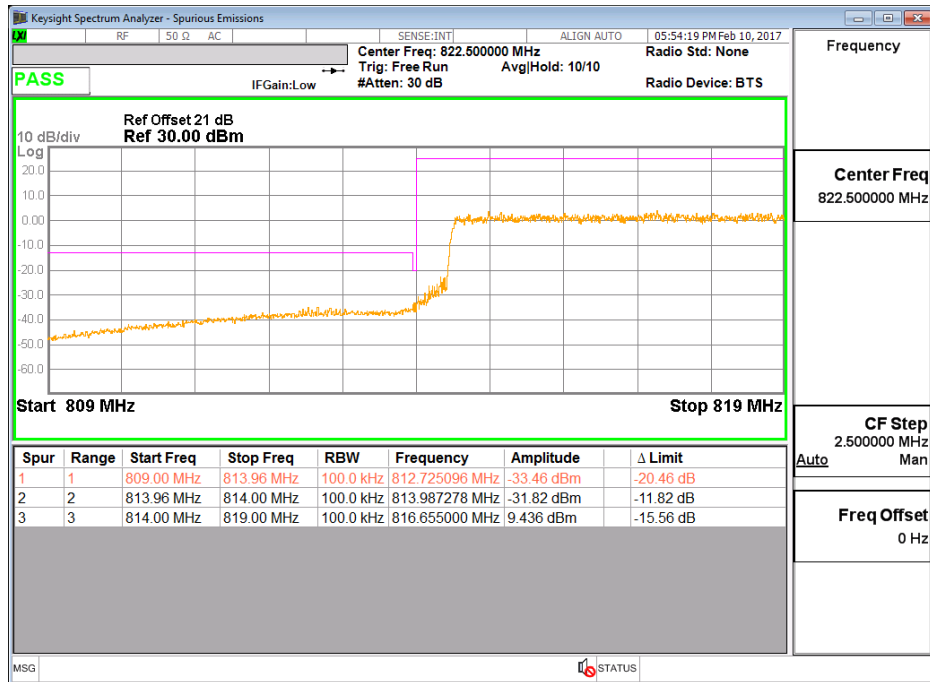
Band 26 (10M) QPSK(1,0) Lower Channel 26740 (819MHz)



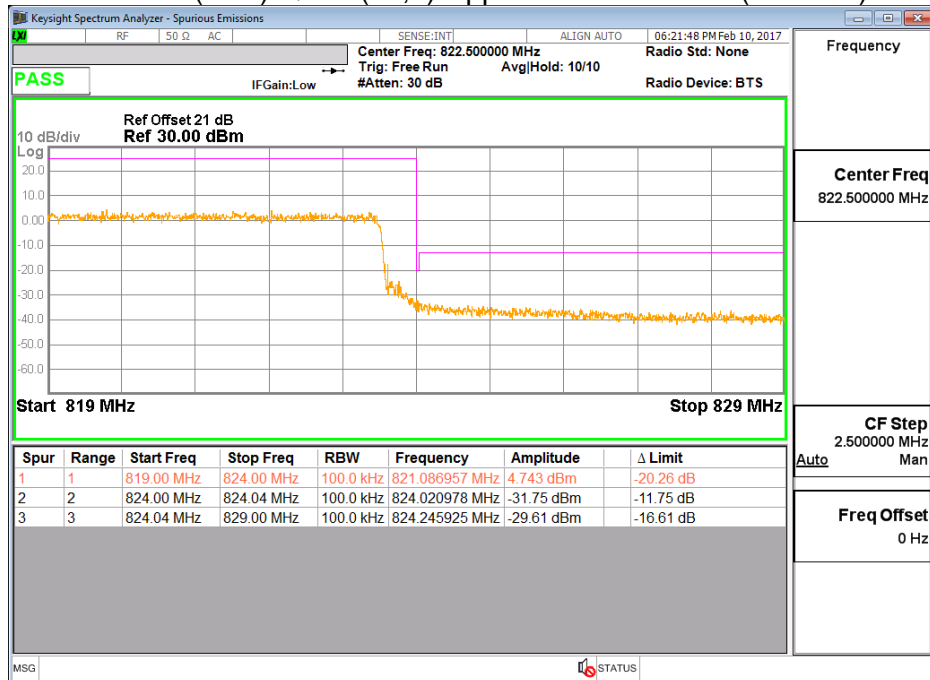
Band 26 (10M) QPSK(1,49) Upper Channel 26740 (819MHz)



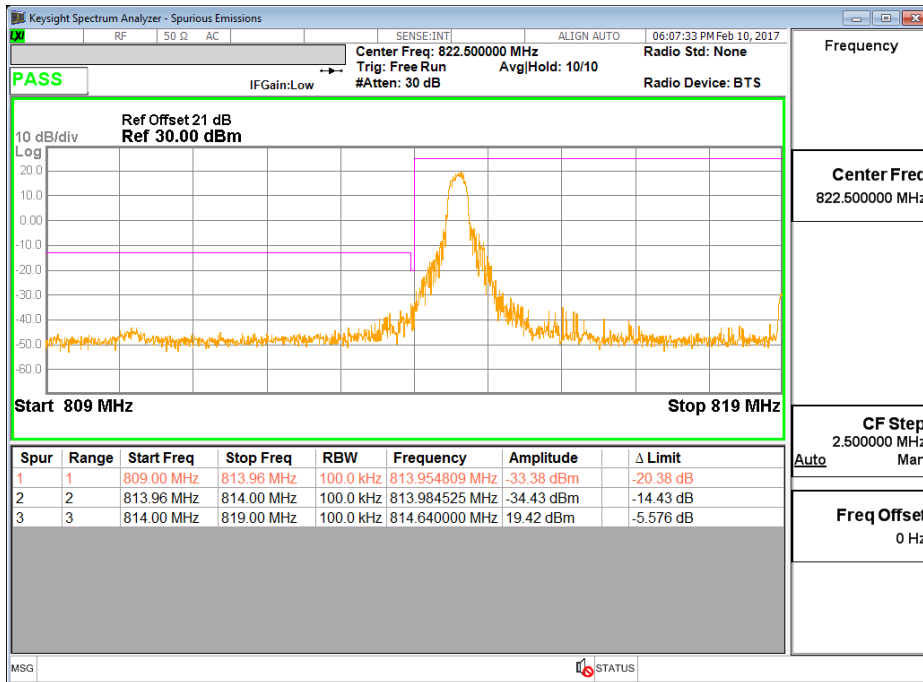
### Band 26 (10M) QPSK(50,0) Lower Channel 26740 (819MHz)



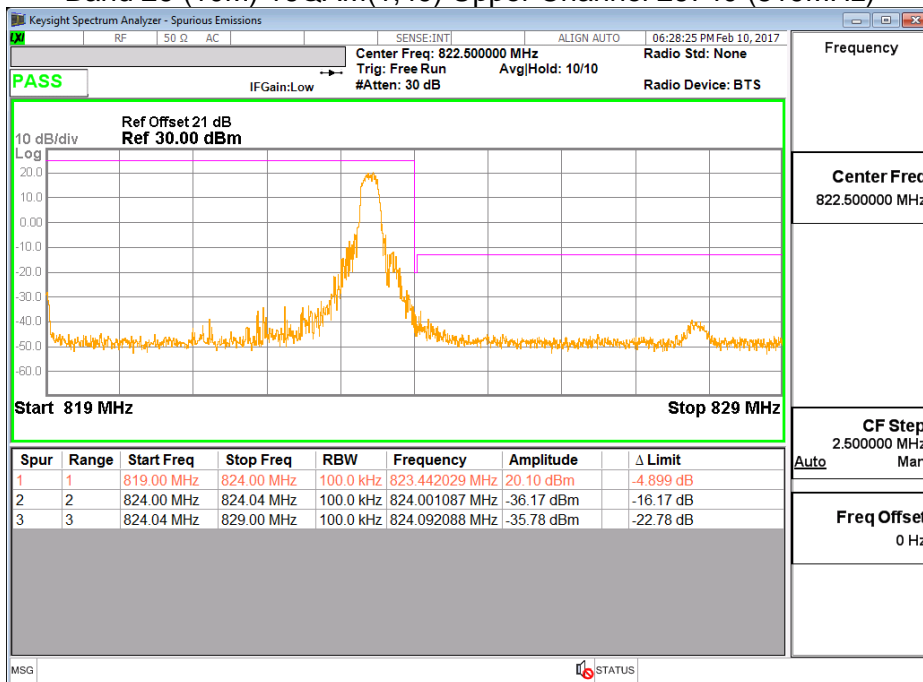
### Band 26 (10M) QPSK(50,0) Upper Channel 26740 (819MHz)



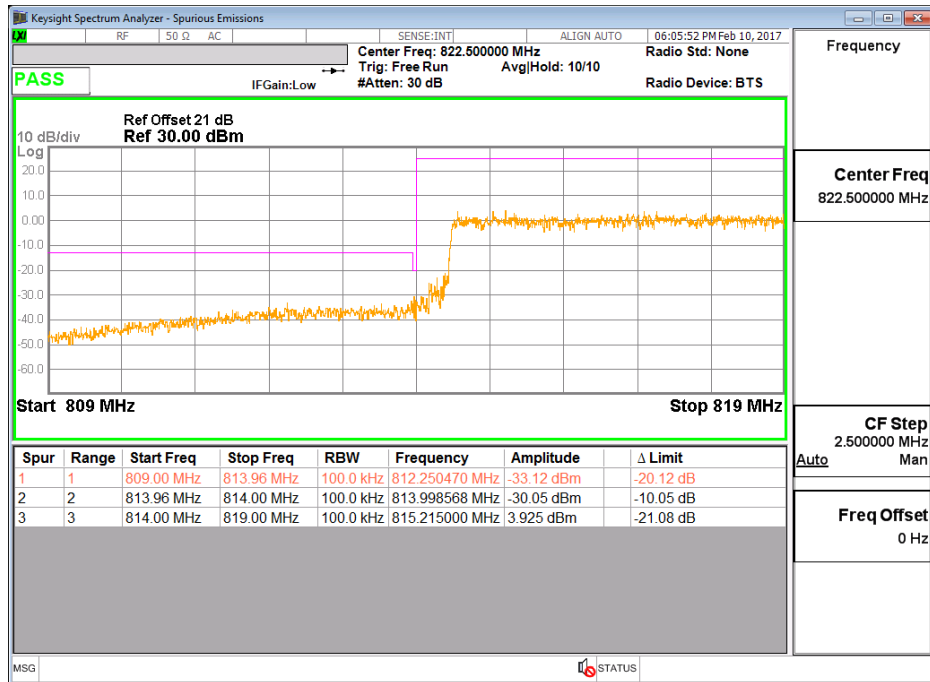
Band 26 (10M) 16QAM(1,0) Lower Channel 26740 (819MHz)



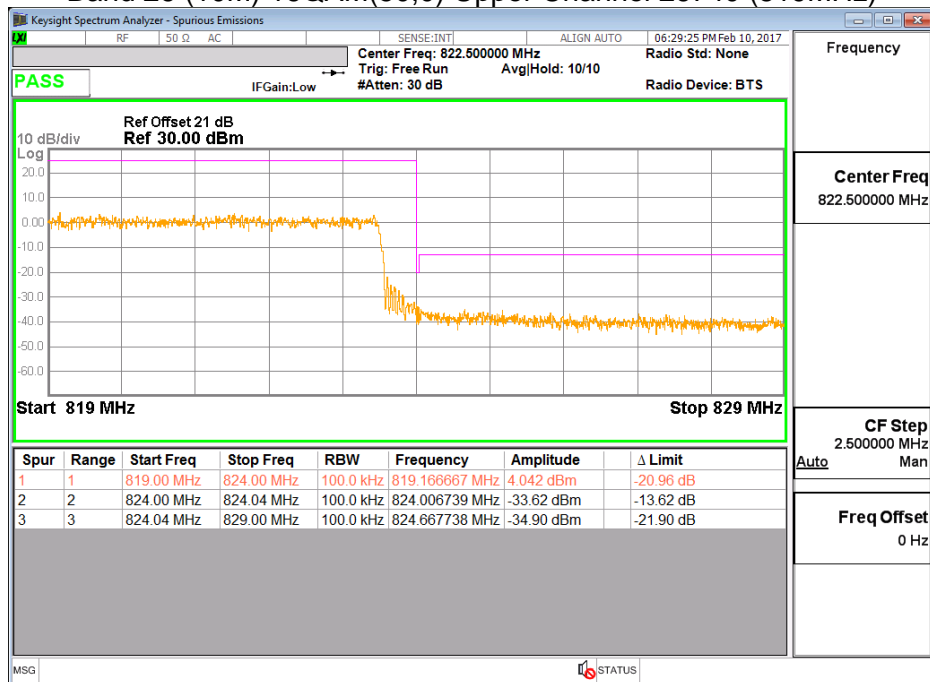
Band 26 (10M) 16QAM(1,49) Upper Channel 26740 (819MHz)



Band 26 (10M) 16QAM(50,0) Lower Channel 26740 (819MHz)



Band 26 (10M) 16QAM(50,0) Upper Channel 26740 (819MHz)



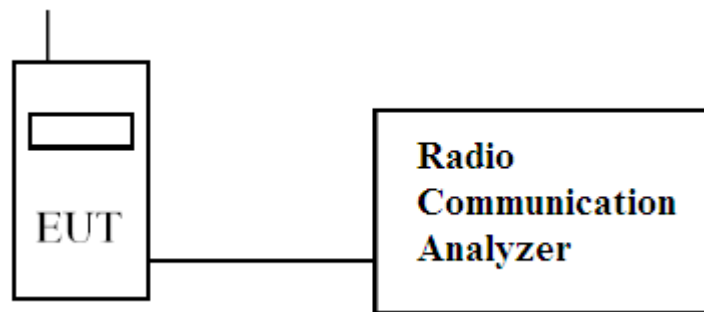


**5.6. Test Specification**

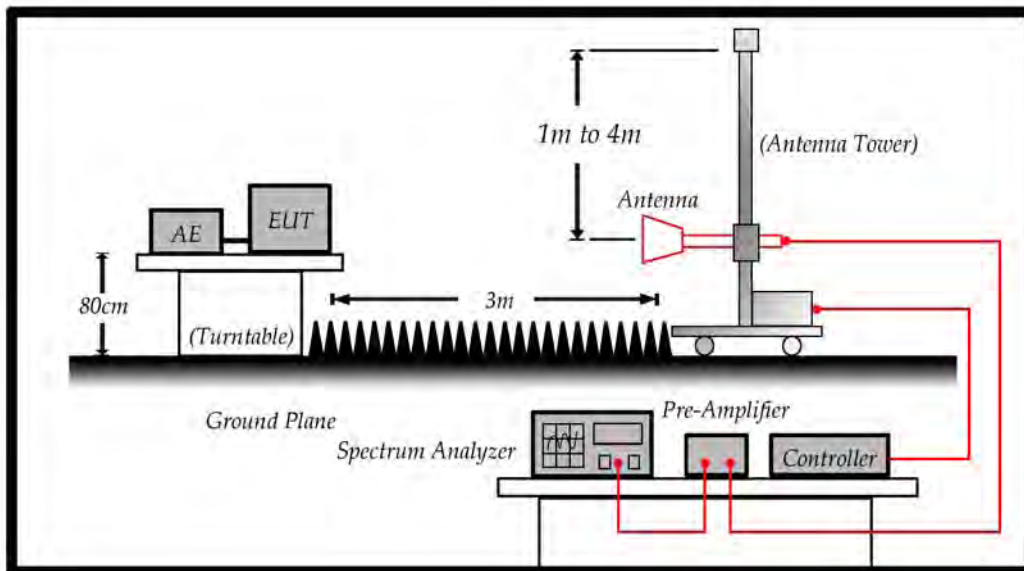
According to Part 2.1051, 90.691

**5.7. Test Setup**

**6.2.1 Spurious emissions at antenna terminals.**



**6.2.2 Field strength of spurious radiation.**



Note: The Worst case Mode is QPSK Mode for Radiated spurious emissions.

## 5.8. Limits

Limit	<-13dBm
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$43 + 10\log(P)$  down on the carrier where P is the power in Watts.

## 5.9. Test Procedure

In accordance with Part 2.1051, 90.691, the spurious emissions from the antenna terminal were measured. The transmitter output power was attenuated using a combination of filters and attenuators and the frequency spectrum investigated from 30MHz to 20GHz. The EUT was set to transmit on full power. The EUT was tested on Low, middle and High channels for both power levels. The resolution and video bandwidth was set to 1MHz/3MHz in accordance with Part 2.1051, 90.691. The spectrum analyzer detector was set to Max Hold. In addition, measurements were made up to the 10<sup>th</sup> harmonic of the fundamental. The device was then replaced with a substitution antenna, which input signal was adjusted until the received level matched that of the previously detected emission.

- (1) The EUT is tested with maximum rated TX power via the Base Station simulator.
- (2) The EUT is tested in three orthogonal planes, The worst case was showing in this report.

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

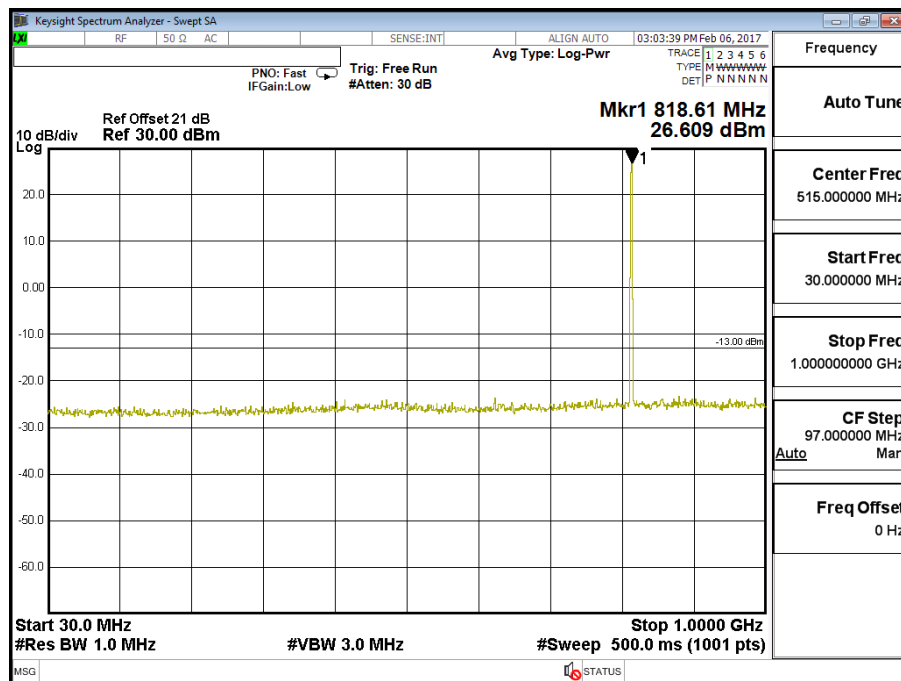
Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to TIA/EIA 603-D on radiated measurement.

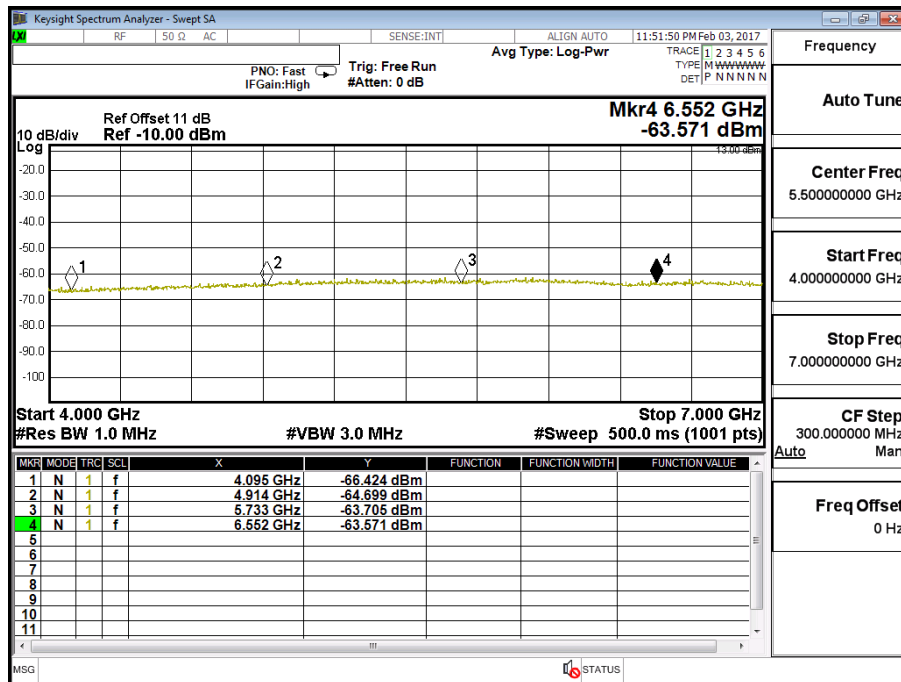
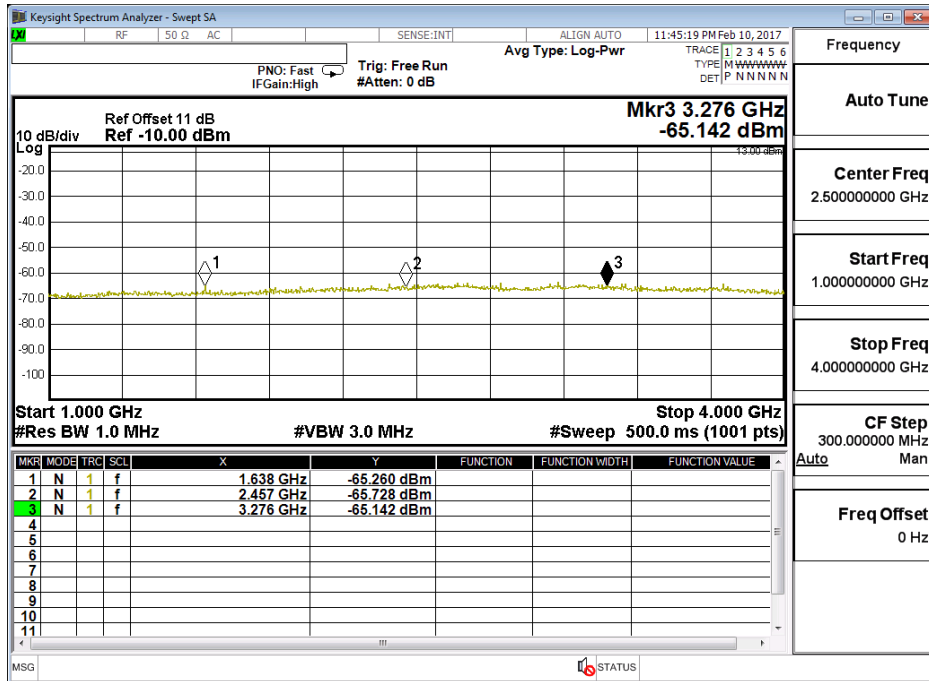
### 5.10. Test Result of Spurious Emission

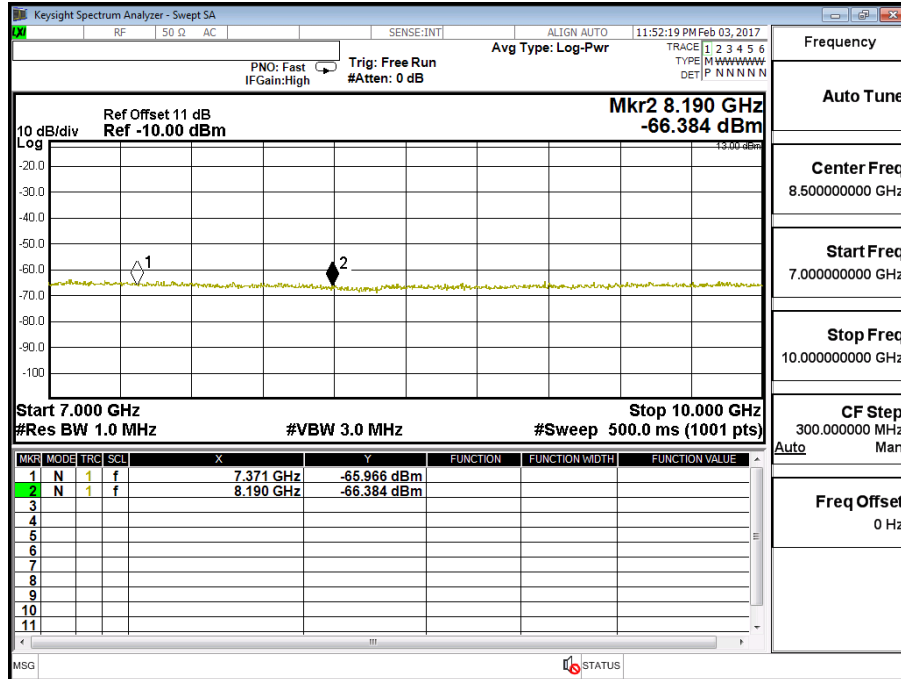
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (1.4M)	Test Range	30MHz~10GHz

#### LTE-Band 26 (1.4M) QPSK(1,0) CH26740 (819MHz)

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-65.260	0.58	-64.680	-13
2457	-65.728	0.7	-65.028	-13
3276	-65.142	1.01	-64.132	-13
4095	-66.424	1.18	-65.244	-13
4914	-64.699	1.23	-63.469	-13
5733	-63.705	1.45	-62.255	-13
6552	-63.571	1.56	-62.011	-13
7371	-65.966	1.59	-64.376	-13
8190	-66.384	1.82	-64.564	-13



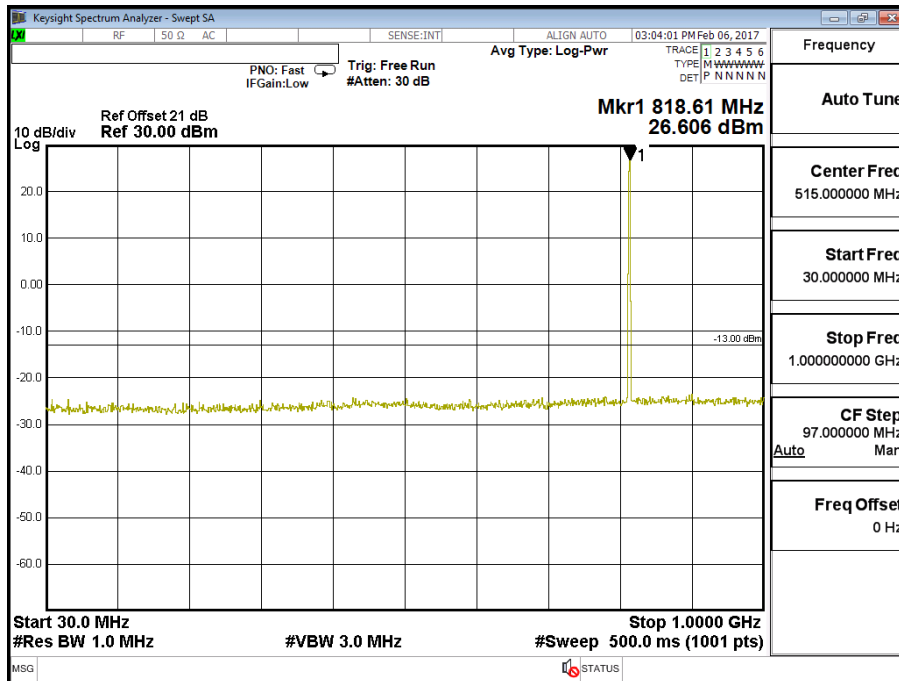


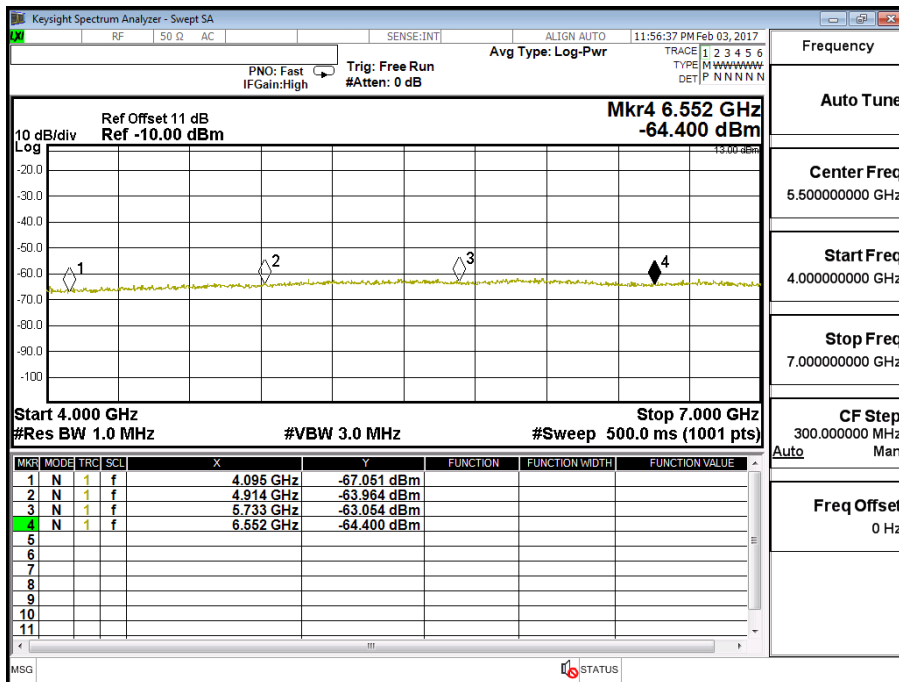
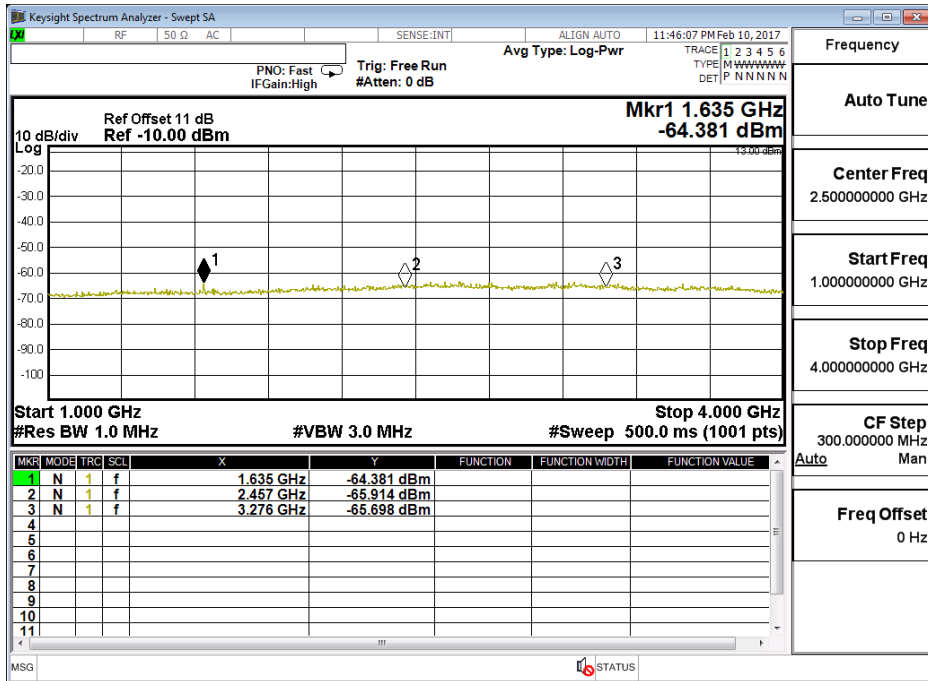


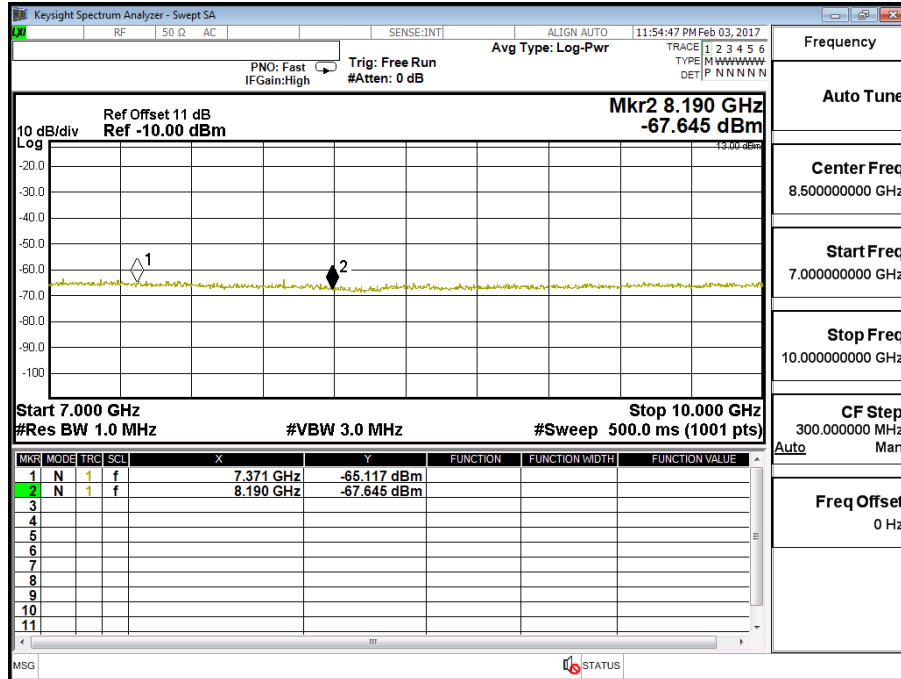
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (1.4M)	Test Range	30MHz~10GHz

**LTE-Band 26 (1.4M) 16QAM(1,0) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1635	-64.381	0.58	-63.801	-13
2457	-65.914	0.7	-65.214	-13
3276	-65.698	1.01	-64.688	-13
4095	-67.051	1.18	-65.871	-13
4914	-63.964	1.23	-62.734	-13
5733	-63.054	1.45	-61.604	-13
6552	-64.400	1.56	-62.840	-13
7371	-65.117	1.59	-63.527	-13
8190	-67.645	1.82	-65.825	-13





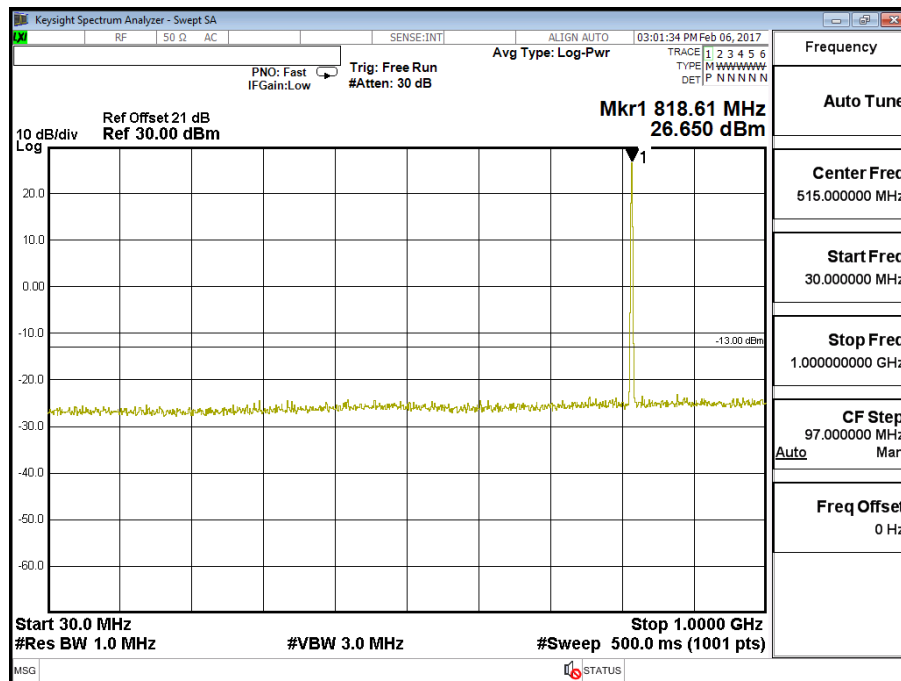


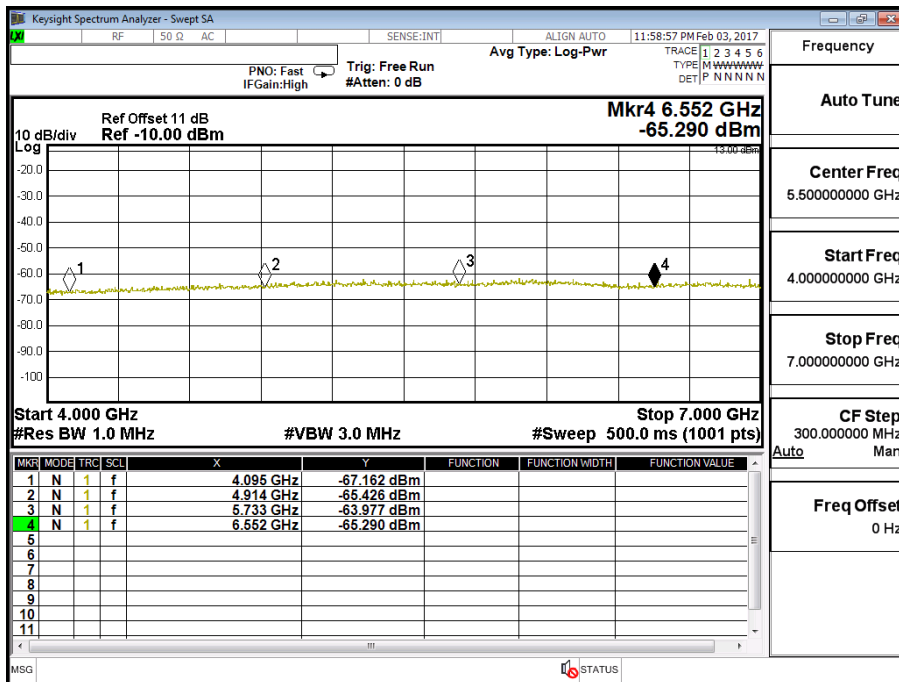
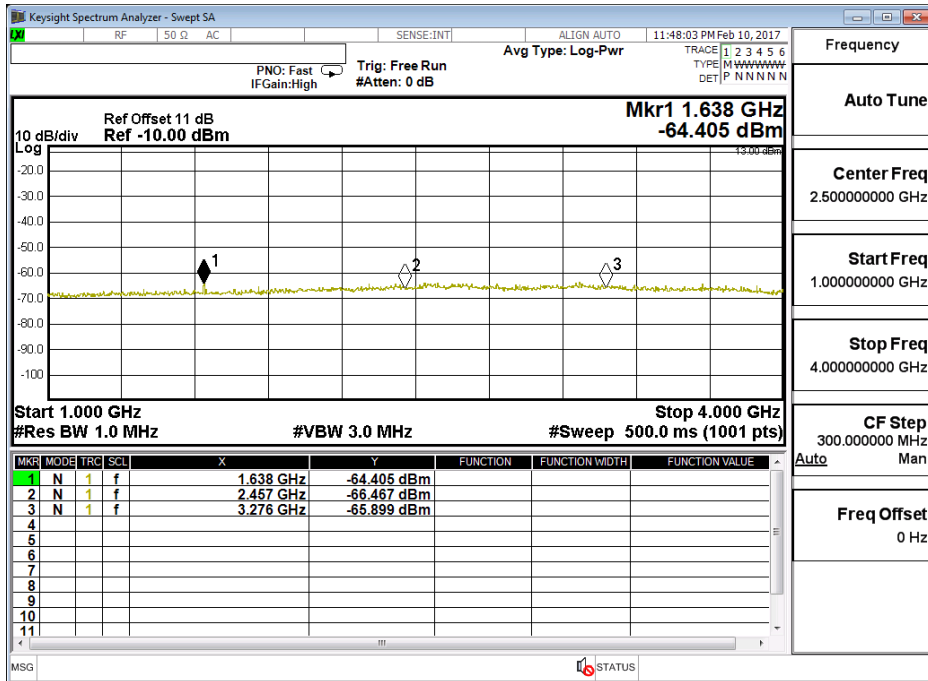


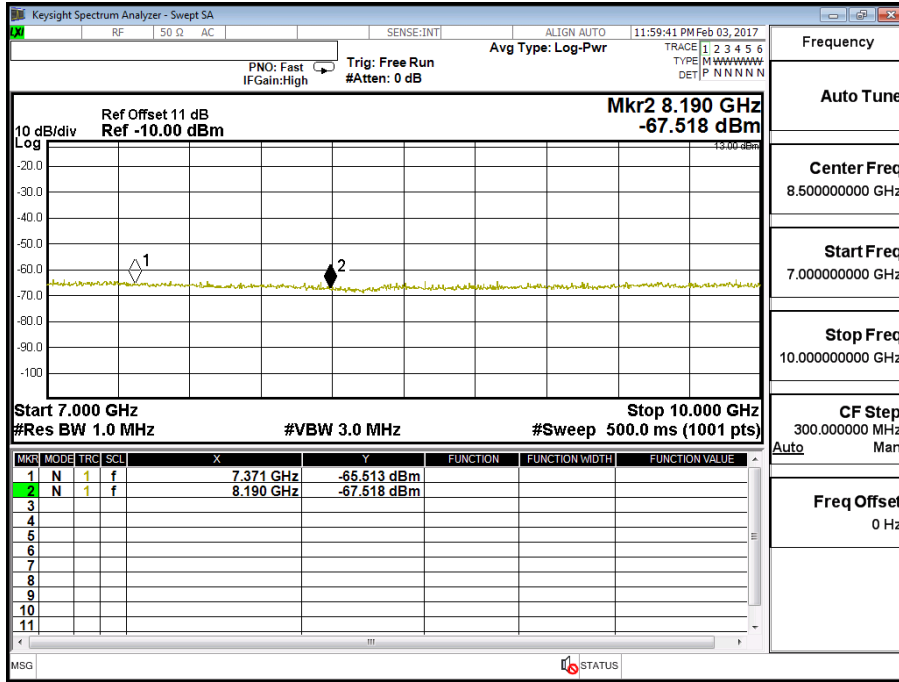
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (3M)	Test Range	30MHz~10GHz

**LTE-Band 26 (3M) QPSK(1,7) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-64.405	0.58	-63.825	-13
2457	-66.467	0.7	-65.767	-13
3276	-65.899	1.01	-64.889	-13
4095	-67.162	1.18	-65.982	-13
4914	-65.426	1.23	-64.196	-13
5733	-63.977	1.45	-62.527	-13
6552	-65.290	1.56	-63.730	-13
7371	-65.513	1.59	-63.923	-13
8190	-67.518	1.82	-65.698	-13



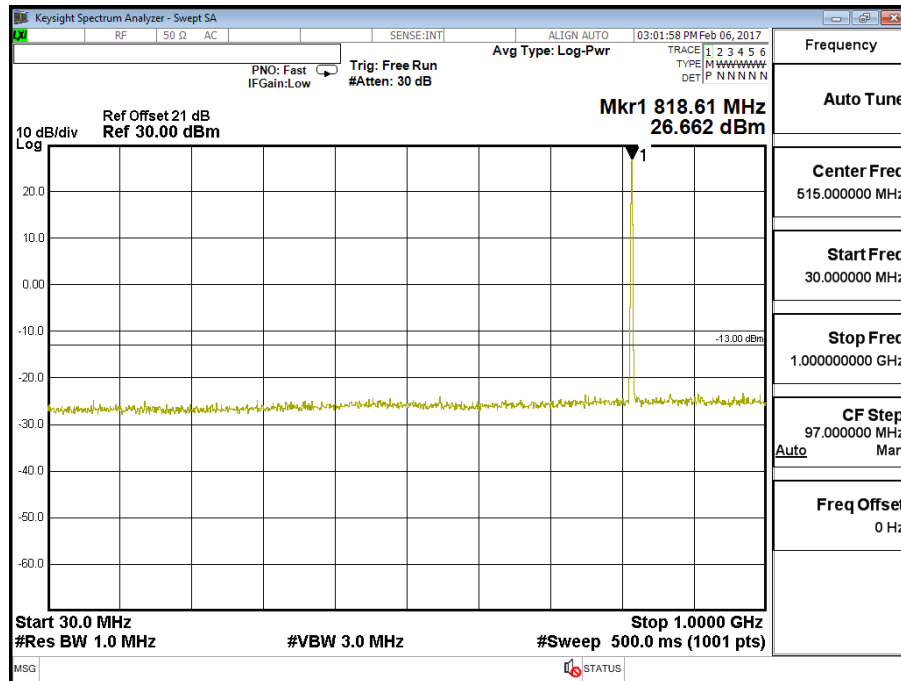


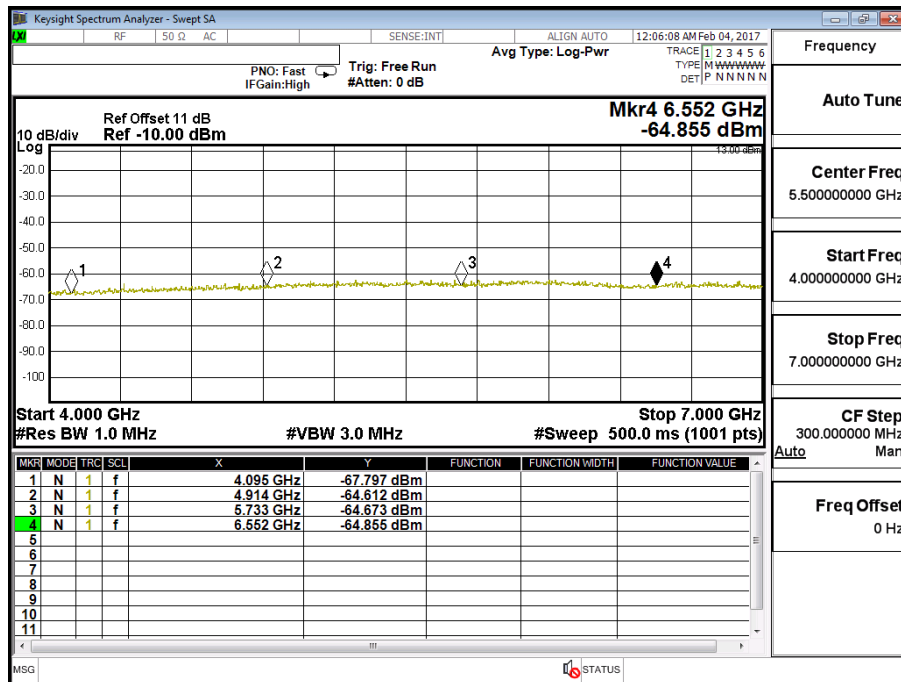
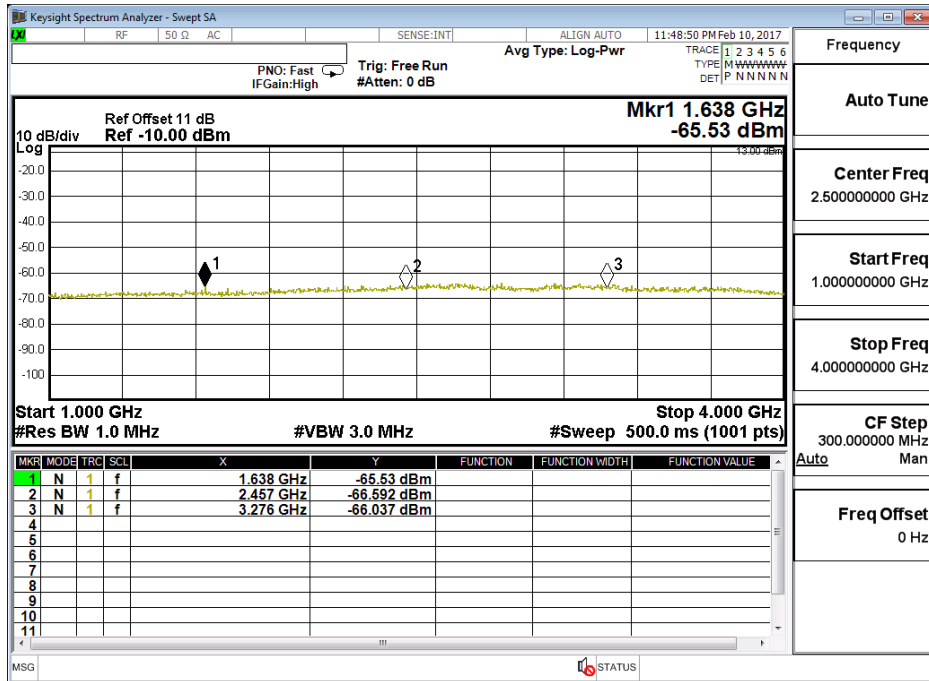


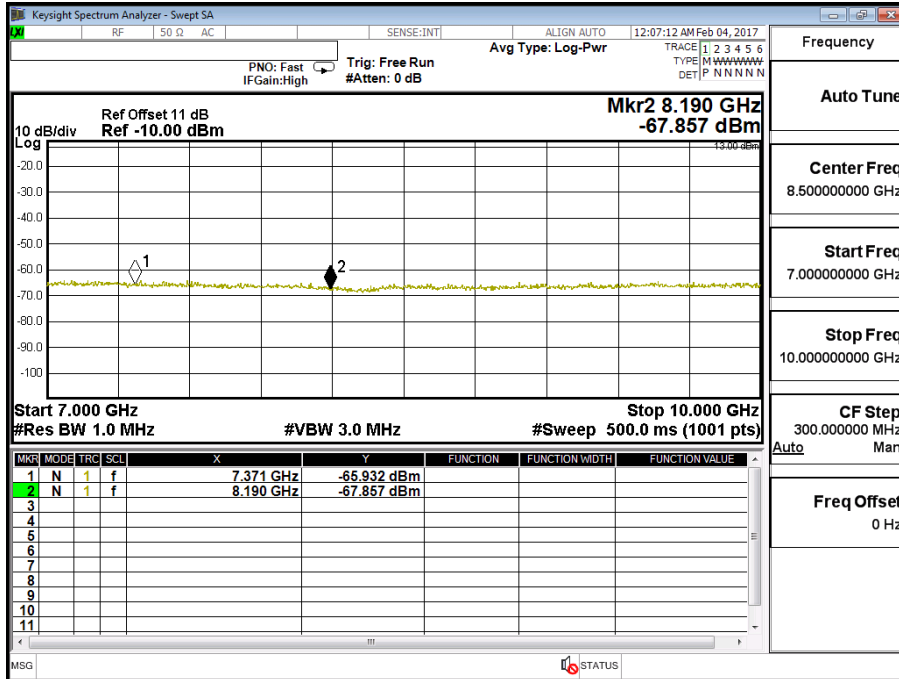
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (3M)	Test Range	30MHz~10GHz

**LTE-Band 26 (3M) 16QAM(1,7) CH26740 (819 MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-65.530	0.58	-64.950	-13
2457	-66.592	0.7	-65.892	-13
3276	-66.037	1.01	-65.027	-13
4095	-67.797	1.18	-66.617	-13
4914	-64.612	1.23	-63.382	-13
5733	-64.673	1.45	-63.223	-13
6552	-64.855	1.56	-63.295	-13
7371	-65.932	1.59	-64.342	-13
8190	-67.857	1.82	-66.037	-13



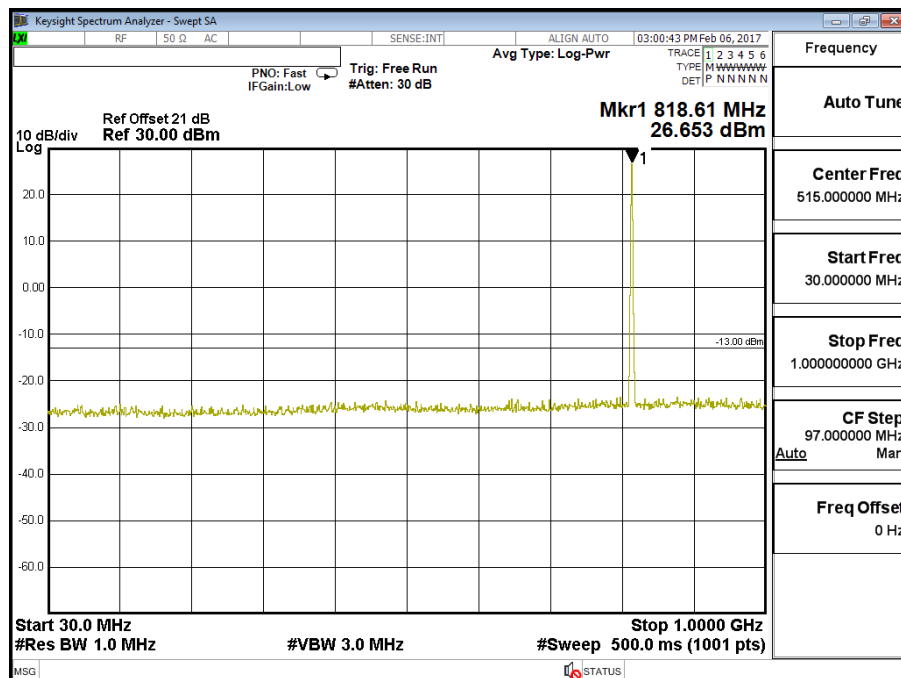


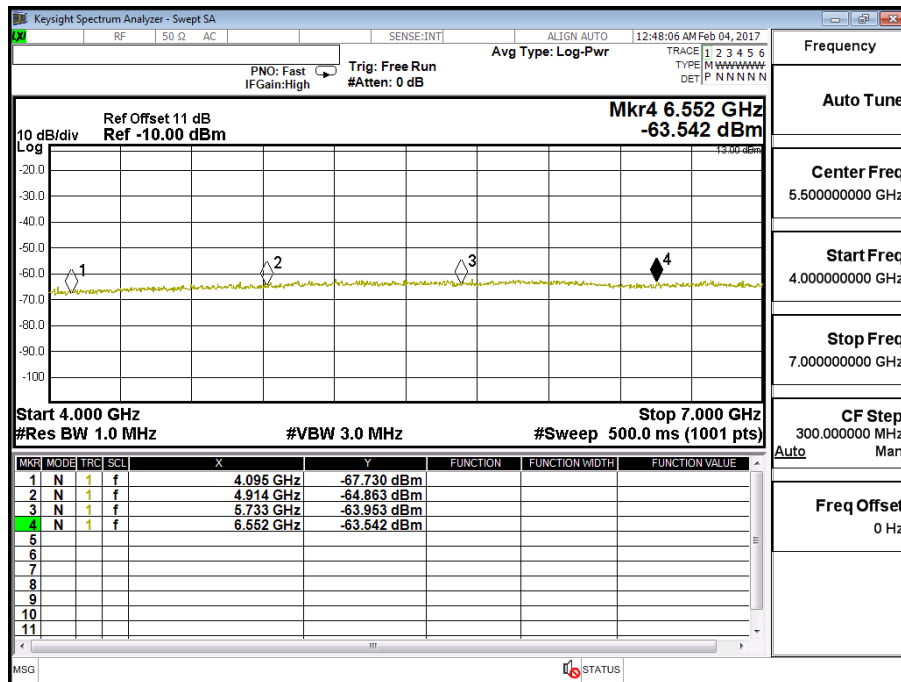
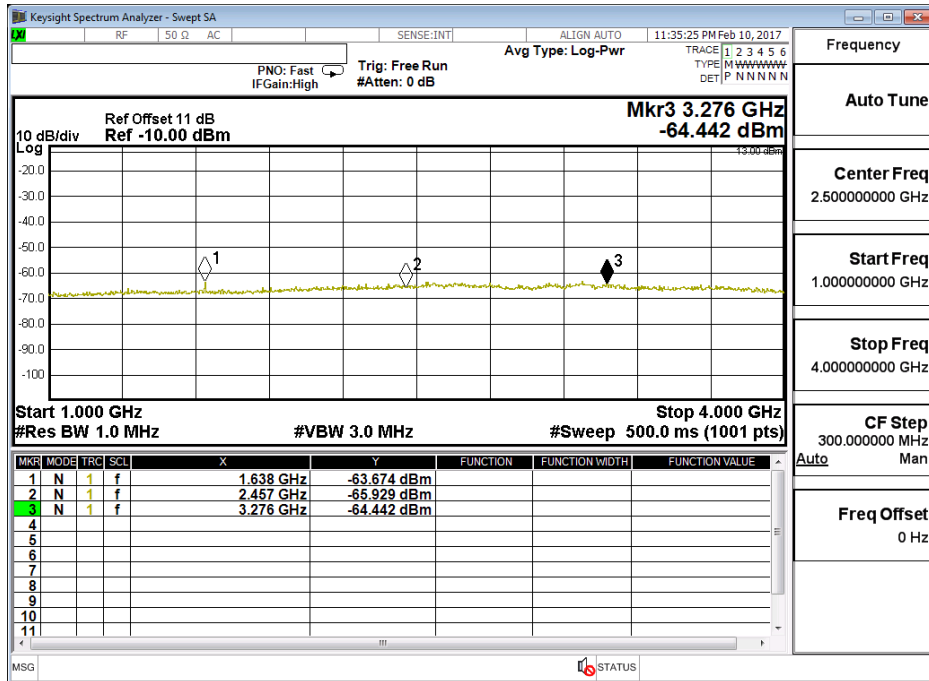


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (5M)	Test Range	30MHz~10GHz

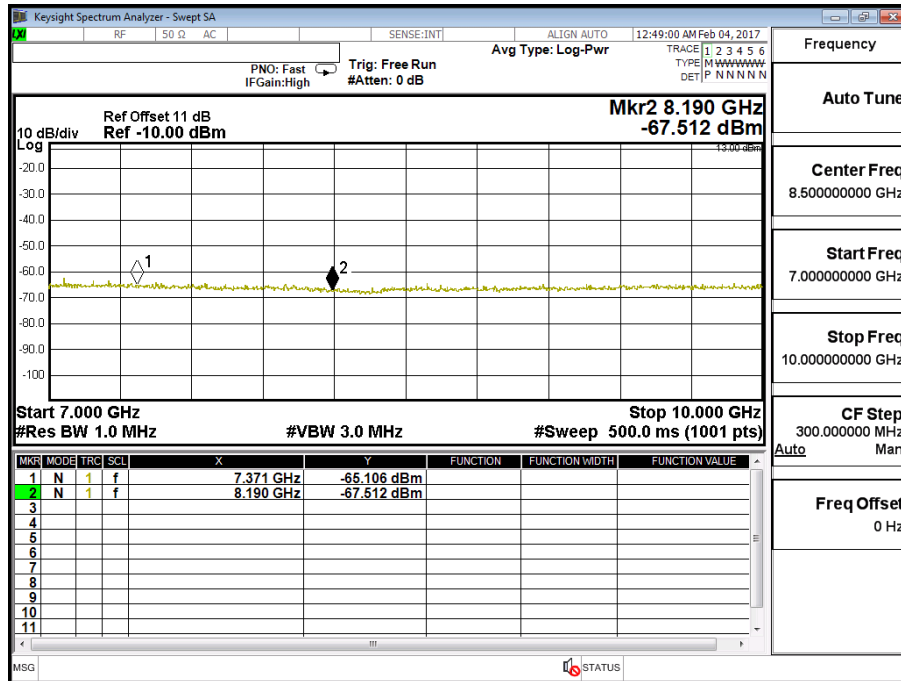
**LTE-Band 26 (5M) QPSK(1,12) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-63.674	0.58	-63.094	-13
2457	-65.929	0.7	-65.229	-13
3276	-64.442	1.01	-63.432	-13
4095	-67.730	1.18	-66.550	-13
4914	-64.863	1.23	-63.633	-13
5733	-63.953	1.45	-62.503	-13
6552	-63.542	1.56	-61.982	-13
7371	-65.106	1.59	-63.516	-13
8190	-67.512	1.82	-65.692	-13





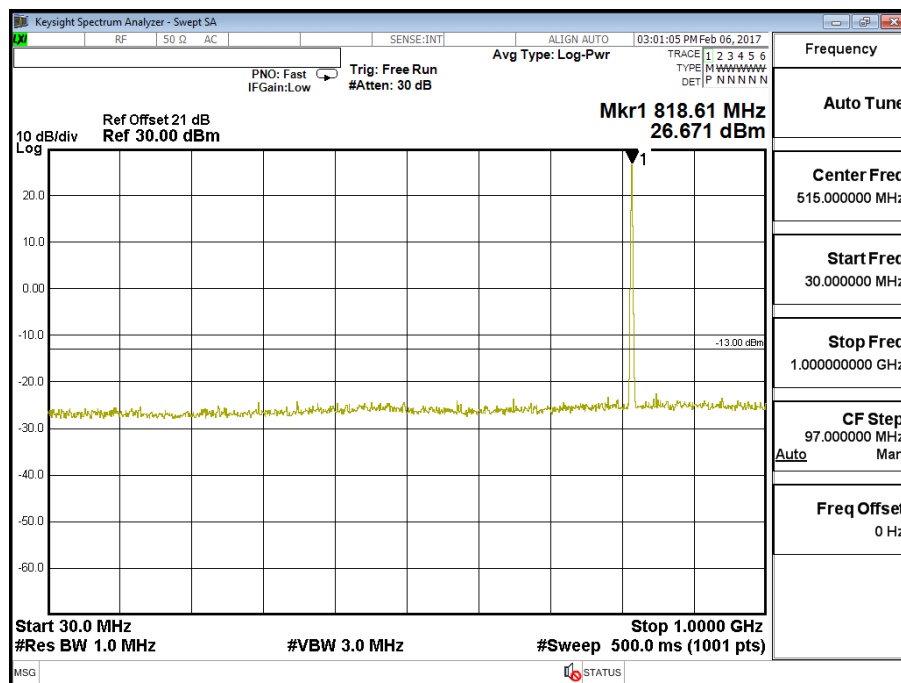


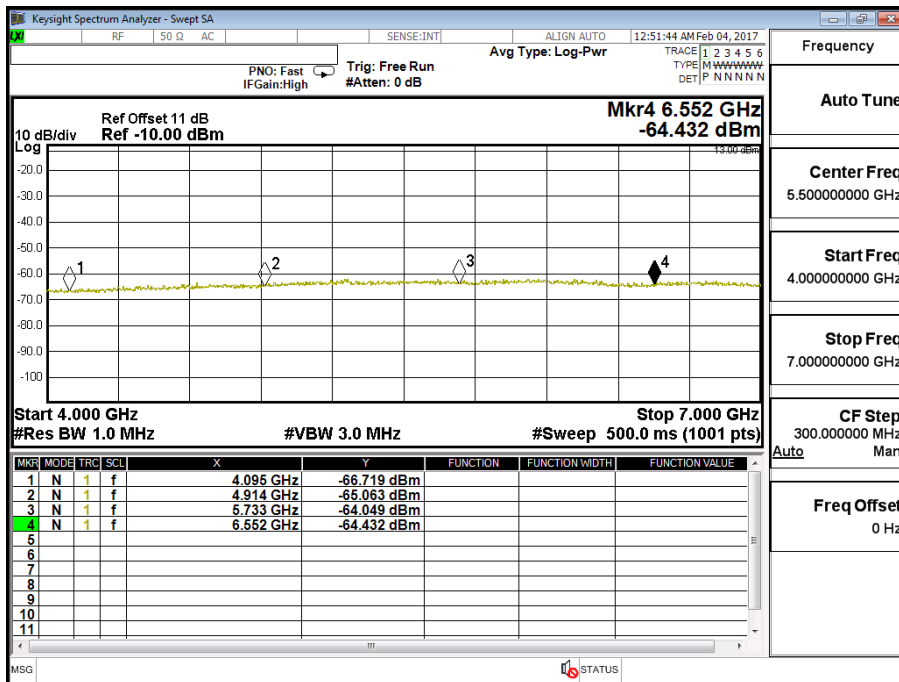
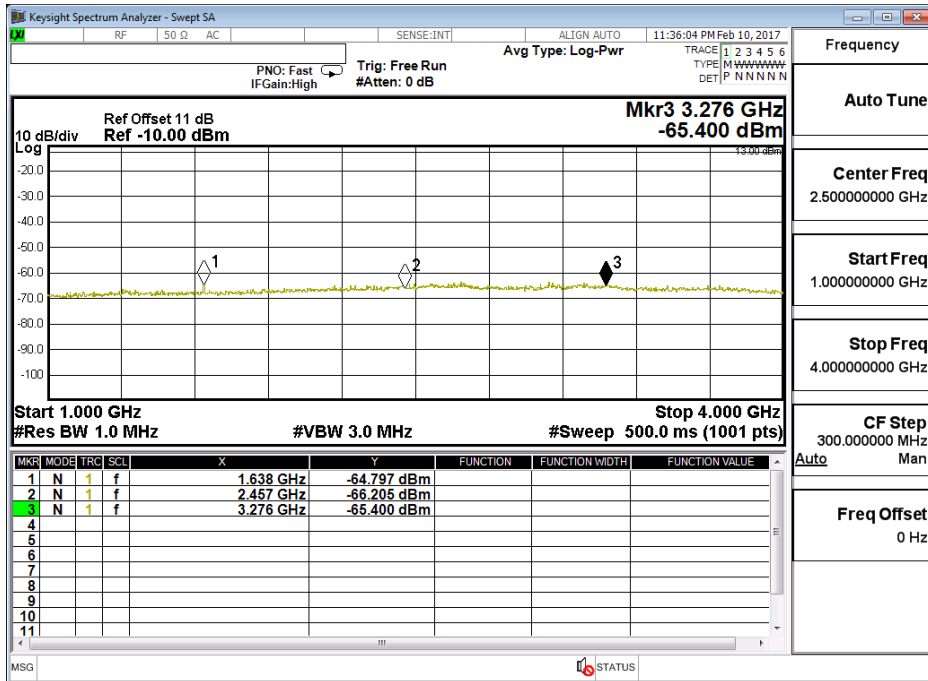


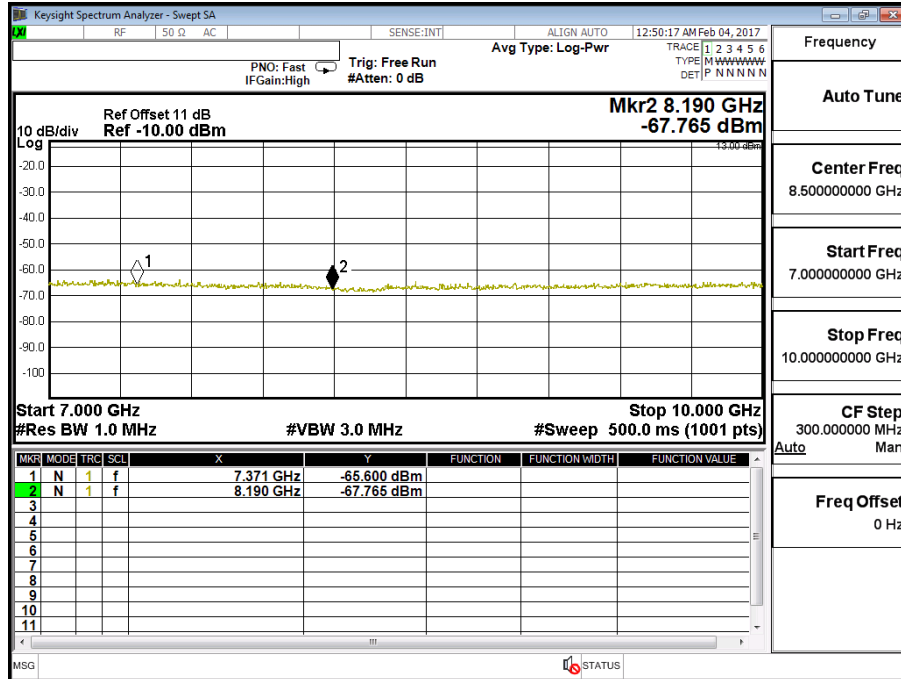
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (5M)	Test Range	30MHz~10GHz

**LTE- Band 26 (5M) 16QAM(1,12) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-64.797	0.58	-64.217	-13
2457	-66.205	0.7	-65.505	-13
3276	-65.400	1.01	-64.390	-13
4095	-66.719	1.18	-65.539	-13
4914	-65.063	1.23	-63.833	-13
5733	-64.049	1.45	-62.599	-13
6552	-64.432	1.56	-62.872	-13
7371	-65.600	1.59	-64.010	-13
8190	-67.765	1.82	-65.945	-13



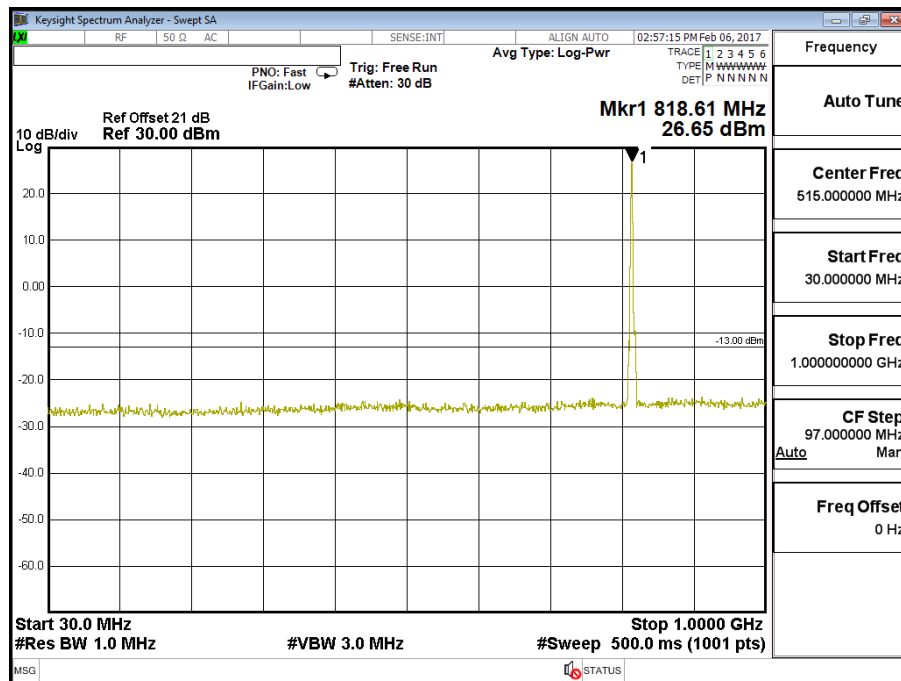


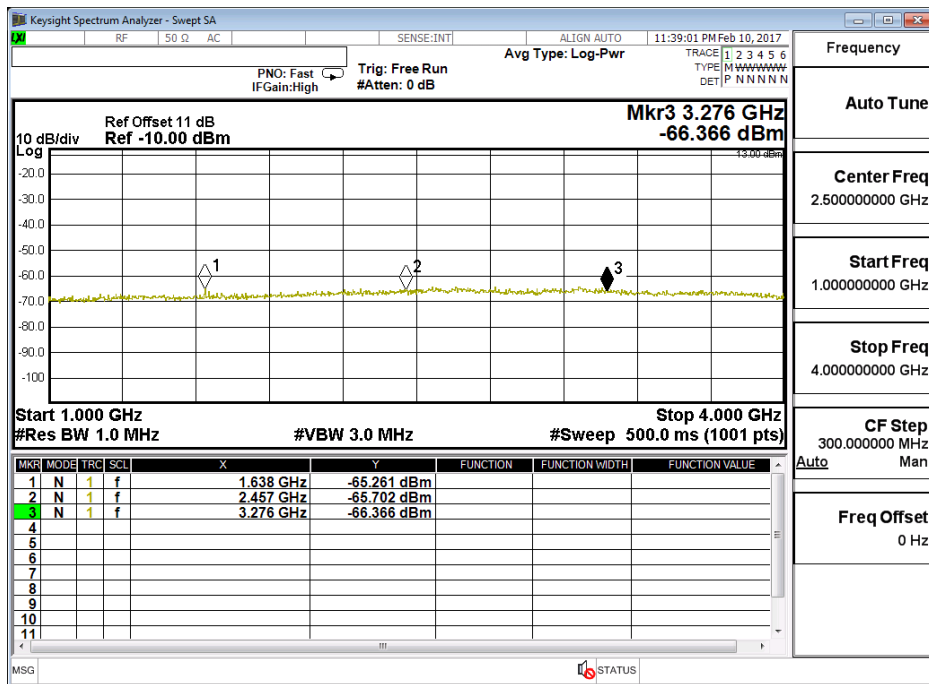


Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (10M)	Test Range	30MHz~10GHz

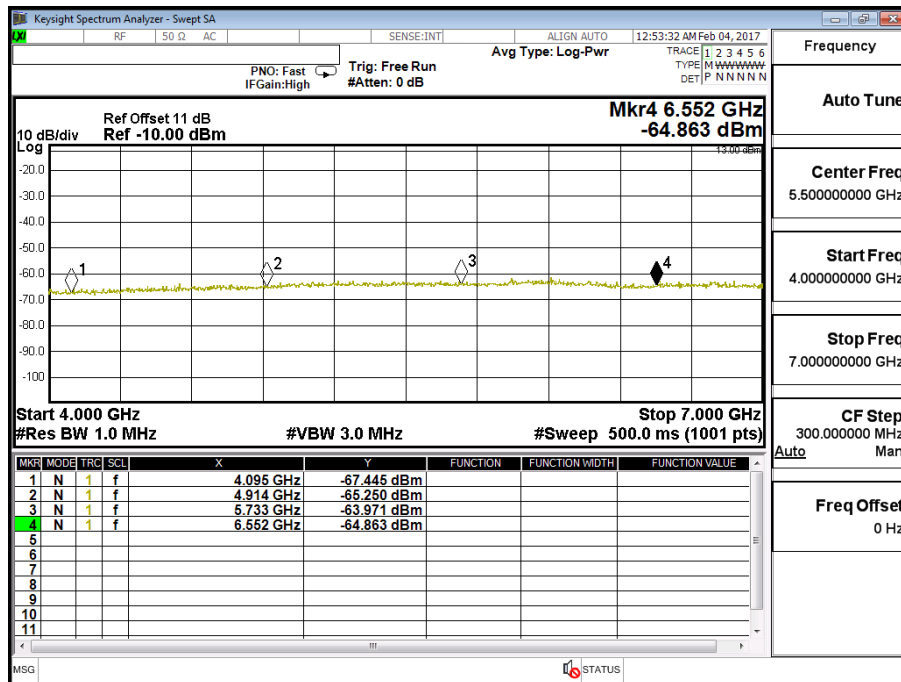
**LTE- Band 26 (10M) QPSK(1,24) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-65.261	0.58	-64.681	-13
2457	-65.702	0.7	-65.002	-13
3276	-66.366	1.01	-65.356	-13
4095	-67.445	1.18	-66.265	-13
4914	-65.250	1.23	-64.020	-13
5733	-63.971	1.45	-62.521	-13
6552	-64.863	1.56	-63.303	-13
7371	-66.222	1.59	-64.632	-13
8190	-67.314	1.82	-65.494	-13

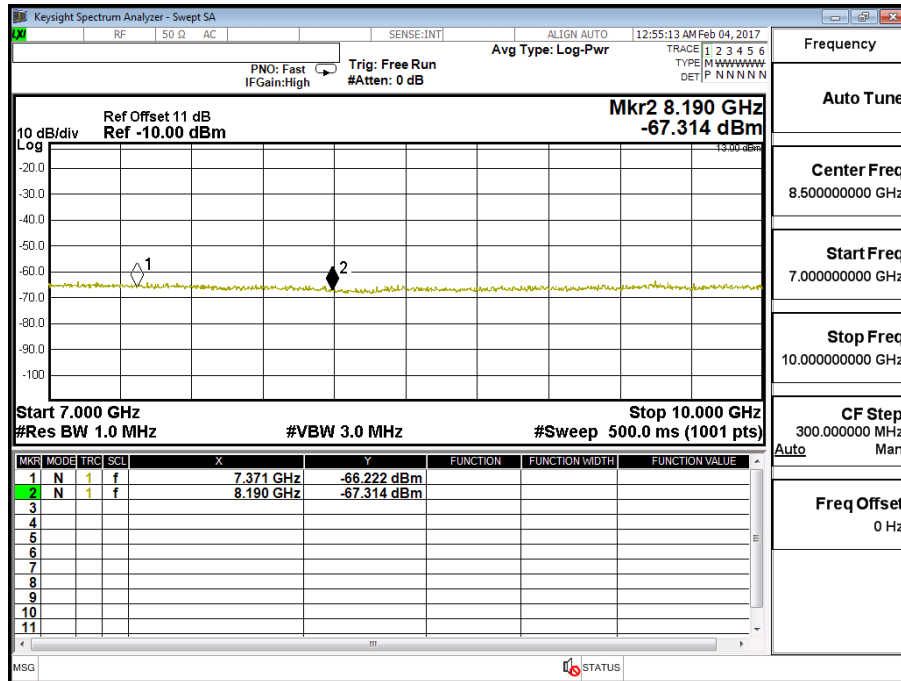




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Auto Tune
Center Freq 2.500000000 GHz
Start Freq 1.000000000 GHz
Stop Freq 4.000000000 GHz
CF Step 300.0000000 MHz
Auto Man
Freq Offset 0 Hz



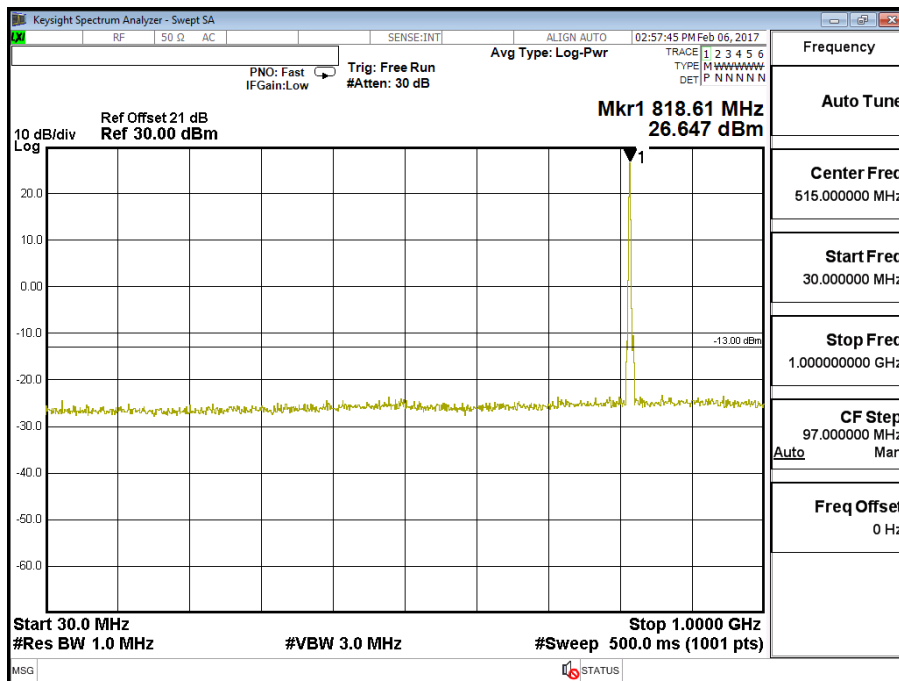
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CF Step 300.0000000 MHz
Auto Man
Freq Offset 0 Hz



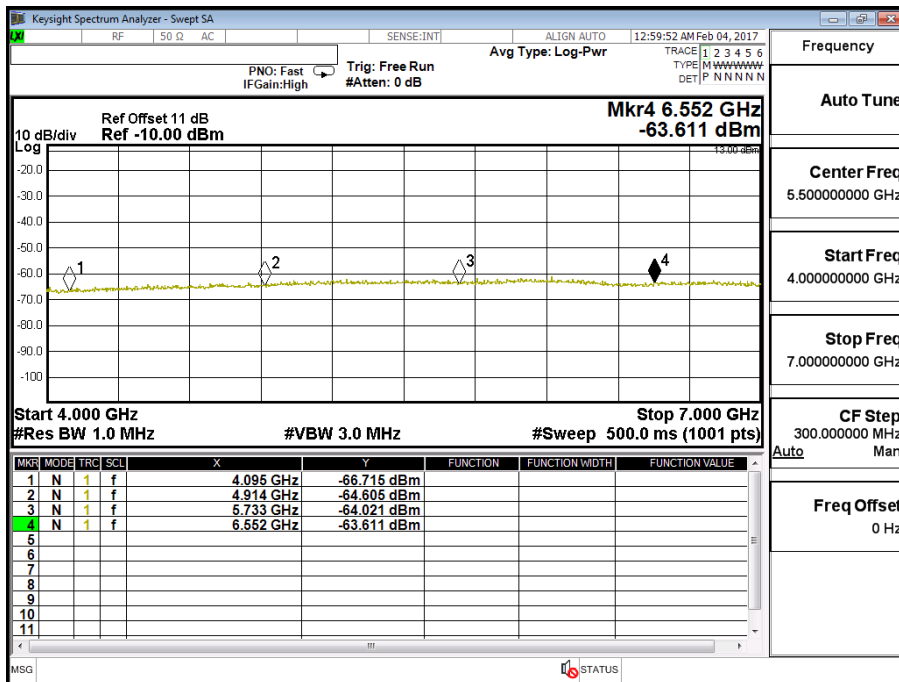
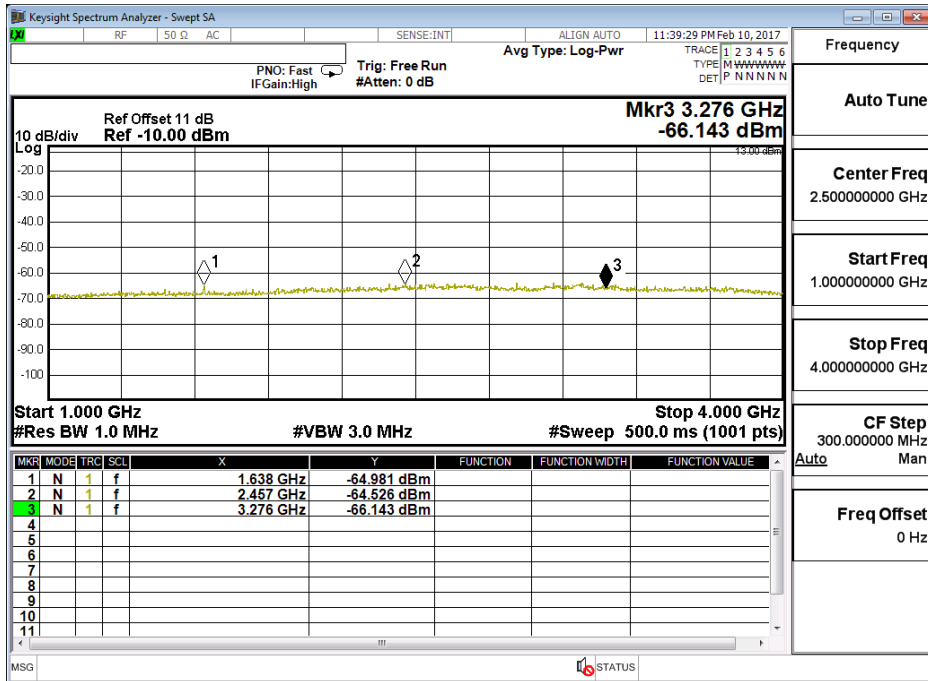
Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Conducted)		
Date of Test	2017/02/06	Test Site	CTR
Test Condition	LTE-Band 26 (10M)	Test Range	30MHz~10GHz

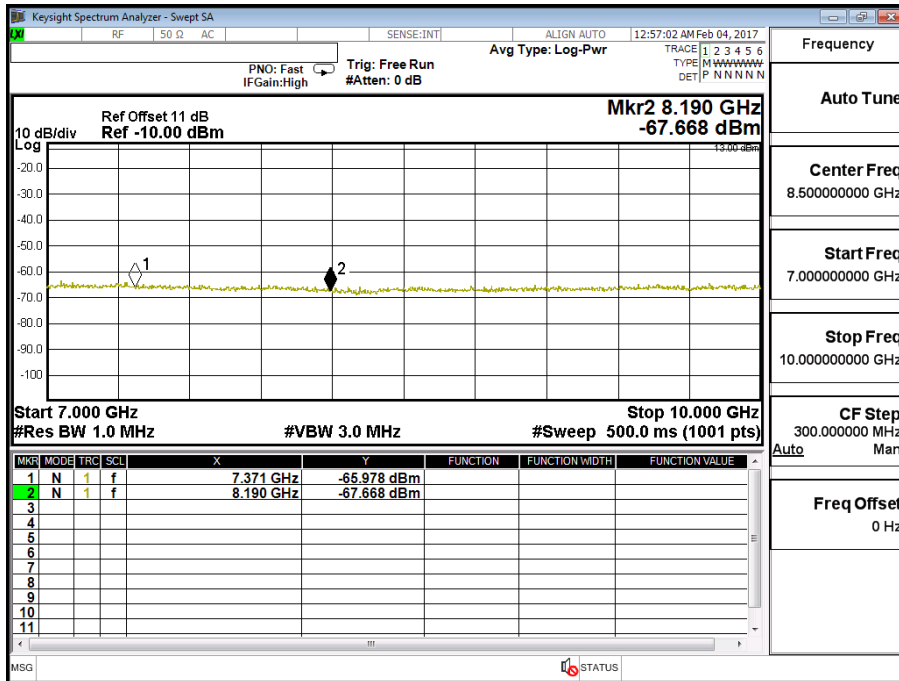
**LTE- Band 26 10M 16QAM(1,24) CH26740 (819MHz)**

Frequency (MHz)	Reading Level (dBm)	Path Loss (dB)	Emission Level (dBm)	Limit (dBm)
1638	-64.981	0.58	-64.401	-13
2457	-64.526	0.7	-63.826	-13
3276	-66.143	1.01	-65.133	-13
4095	-66.715	1.18	-65.535	-13
4914	-64.605	1.23	-63.375	-13
5733	-64.021	1.45	-62.571	-13
6552	-63.611	1.56	-62.051	-13
7371	-65.978	1.59	-64.388	-13
8190	-67.668	1.82	-65.848	-13









Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2017/02/07	Test Site	Site3
Test Condition	Band 26 (1.4M) QPSK(1,0)	Test Range	9kHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

#### Horizontal Emissions Band 26 (1.4M) QPSK(1,0) CH26740 (819MHz)

1638	-63.710	-67.281	1.630	9.800	-59.111	-13
2457	-64.466	-64.873	2.100	10.600	-56.373	-13
3276	-60.720	-62.340	2.350	12.300	-52.390	-13
4095	-63.085	-61.985	2.700	12.600	-52.085	-13
4914	-63.365	-59.368	2.830	12.700	-49.498	-13
5733	-63.647	-61.368	3.200	13.000	-51.568	-13

#### Vertical Emissions Band 26 (1.4M) QPSK(1,0) CH26740 (819MHz)

1638	-63.732	-67.008	1.630	9.800	-58.838	-13
2457	-64.395	-64.485	2.100	10.600	-55.985	-13
3276	-61.267	-61.760	2.350	12.300	-51.810	-13
4095	-62.781	-60.010	2.700	12.600	-50.11	-13
4914	-63.474	-59.076	2.830	12.700	-49.206	-13
5733	-63.106	-60.717	3.200	13.000	-50.917	-13

#### Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2017/02/07	Test Site	Site3
Test Condition	Band 26 (3M) QPSK(1,7)	Test Range	9kHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

#### Horizontal Emissions Band 26 (3M) QPSK(1,7) CH26740 (819MHz)

1638	-63.621	-67.192	1.630	9.800	-59.022	-13
2457	-64.479	-64.886	2.100	10.600	-56.386	-13
3276	-61.319	-62.939	2.350	12.300	-52.989	-13
4095	-63.154	-62.054	2.700	12.600	-52.154	-13
4914	-63.414	-59.417	2.830	12.700	-49.547	-13
5733	-63.773	-61.494	3.200	13.000	-51.694	-13

#### Vertical Emissions Band 26 (3M) QPSK(1,7) CH26740 (819MHz)

1638	-63.047	-66.322	1.630	9.800	-58.152	-13
2457	-64.233	-64.323	2.100	10.600	-55.823	-13
3276	-60.166	-60.621	2.350	12.300	-50.671	-13
4095	-63.186	-60.416	2.700	12.600	-50.516	-13
4914	-63.277	-58.879	2.830	12.700	-49.009	-13
5733	-62.986	-60.597	3.200	13.000	-50.797	-13

#### Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2017/02/08	Test Site	Site3
Test Condition	Band 26 (5M) QPSK(1,12)	Test Range	9kHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

#### Horizontal Emissions Band 26 (5M) QPSK(1,12) CH26740 (819MHz)

1638	-63.315	-66.886	1.630	9.800	-58.716	-13
2457	-63.759	-64.166	2.100	10.600	-55.666	-13
3276	-60.711	-62.331	2.350	12.300	-52.381	-13
4095	-63.182	-62.081	2.700	12.600	-52.181	-13
4914	-63.343	-59.364	2.830	12.700	-49.494	-13
5733	-63.783	-61.505	3.200	13.000	-51.705	-13

#### Vertical Emissions Band 26 (5M) QPSK(1,12) CH26740 (819MHz)

1638	-62.541	-65.816	1.630	9.800	-57.646	-13
2457	-63.762	-63.852	2.100	10.600	-55.352	-13
3276	-60.966	-61.459	2.350	12.300	-51.509	-13
4095	-62.613	-59.842	2.700	12.600	-49.942	-13
4914	-64.140	-59.743	2.830	12.700	-49.873	-13
5733	-63.602	-61.212	3.200	13.000	-51.412	-13

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Spurious Emission (Radiated)		
Date of Test	2017/02/08	Test Site	Site3
Test Condition	Band 26 (10M) QPSK(1,24)	Test Range	9kHz ~10GHz

Frequency	Reading Level	Signal Generator Level	Cable Loss	Antenna Gain	EIRP Value	Limit
(GHz)	(dBm)	(dBm)	(dB)	(dBi)	(dBm)	(dBm)

#### Horizontal Emissions Band 26 (10M) QPSK(1,24) CH26740 (819MHz)

1638	-63.800	-67.371	1.630	9.800	-59.201	-13
2457	-64.794	-65.202	2.100	10.600	-56.702	-13
3276	-59.634	-61.207	2.350	12.300	-51.257	-13
4095	-62.834	-61.734	2.700	12.600	-51.834	-13
4914	-64.223	-60.226	2.830	12.700	-50.356	-13
5733	-62.936	-60.657	3.200	13.000	-50.857	-13

#### Vertical Emissions Band 26 (10M) QPSK(1,24) CH26740 (819MHz)

1638	-63.735	-67.010	1.630	9.800	-58.840	-13
2457	-64.346	-64.436	2.100	10.600	-55.936	-13
3276	-60.189	-60.644	2.350	12.300	-50.694	-13
4095	-63.165	-60.394	2.700	12.600	-50.494	-13
4914	-63.403	-59.005	2.830	12.700	-49.135	-13
5733	-63.926	-61.537	3.200	13.000	-51.737	-13

#### Note:

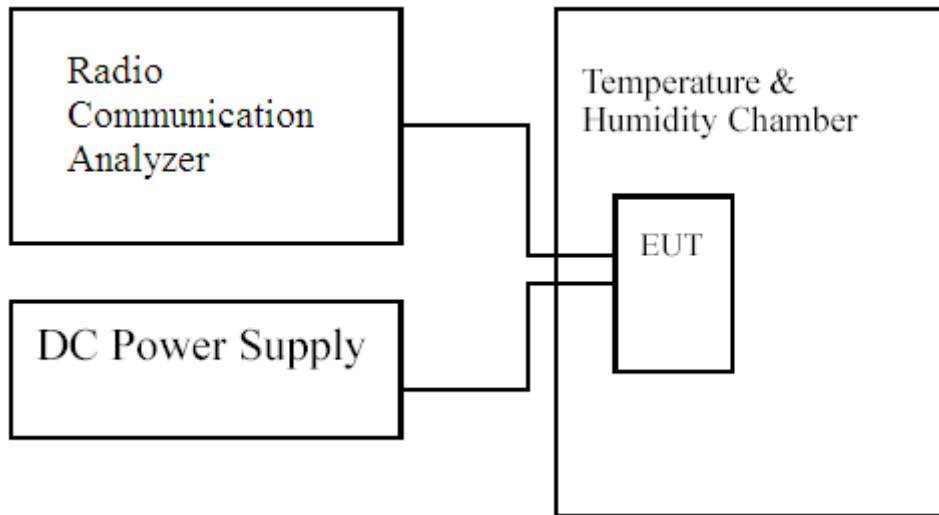
1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:3MHz
2. EIRP Value = Signal Generator Level + Antenna Gain - Cable Loss
3. Spurious emissions past 6 GHz are not shown, due to the magnitude of spurious emissions attenuated more than 20 dB below the limit.

## 6. Frequency Stability Under Temperature & Voltage Variations

### 6.1. Test Specification

According to Part 2.1055, 90.691

### 6.2. Test Setup



### 6.3. Limits

Limit	$<\pm 2.5\text{ppm}$
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### 6.4. Test Procedure

The frequency stability of transmitter is measured by:

- (a) Temperature: The temperature is varied from  $-30^{\circ}\text{C}$  to  $50^{\circ}\text{C}$  in  $10^{\circ}\text{C}$  increment using a standard temperature & Humidity chamber.
- (b) Primary Supply Voltage: The primary supply voltage is varied 85% to 115% of the nominal value for non hand-carried equipment. For hand-carried, battery-powered equipment, primary supply voltage is reduced to the battery operating endpoint which shall be specified by the manufacturer.

The EUT was connected via the base station simulator. Universal Radio Communication Tester, (MT8820C), was used to measure The Frequency Error. The maximum result of measurements was recorded.

## 6.5. Test Result of Frequency Stability Under Temperature Variations

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (1.4M) CH26740(819MHz) –QPSK	Test Range	-20°C ~+50°C

### Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0033	±2.05
-20	0.819	0.0043	±2.05
-10	0.819	0.0046	±2.05
0	0.819	0.0048	±2.05
10	0.819	-0.0037	±2.05
20	0.819	-0.0056	±2.05
30	0.819	0.0040	±2.05
40	0.819	0.0051	±2.05
50	0.819	0.0045	±2.05

### Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0045	±2.05
120	0.819	-0.0056	±2.05
102	0.819	-0.0061	±2.05



Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (1.4M) CH26740(819MHz) –16QAM	Test Range	-20°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0047	±2.05
-20	0.819	-0.0069	±2.05
-10	0.819	-0.0045	±2.05
0	0.819	-0.0049	±2.05
10	0.819	0.0044	±2.05
20	0.819	-0.0073	±2.05
30	0.819	0.0056	±2.05
40	0.819	0.0049	±2.05
50	0.819	-0.0053	±2.05

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0046	±2.05
120	0.819	-0.0073	±2.05
102	0.819	-0.0051	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (3M) CH26740(819MHz) –QPSK	Test Range	-30°C ~+50°C

#### Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0049	±2.05
-20	0.819	0.0037	±2.05
-10	0.819	0.0032	±2.05
0	0.819	0.0062	±2.05
10	0.819	-0.0053	±2.05
20	0.819	-0.0054	±2.05
30	0.819	0.0060	±2.05
40	0.819	0.0041	±2.05
50	0.819	-0.0044	±2.05

#### Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0080	±2.05
120	0.819	-0.0054	±2.05
102	0.819	-0.0068	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (3M) CH26740(819MHz) –16QAM	Test Range	-30°C ~+50°C

#### Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	0.0049	±2.05
-20	0.819	-0.0045	±2.05
-10	0.819	-0.0052	±2.05
0	0.819	0.0046	±2.05
10	0.819	-0.0065	±2.05
20	0.819	-0.0061	±2.05
30	0.819	-0.0040	±2.05
40	0.819	-0.0044	±2.05
50	0.819	-0.0041	±2.05

#### Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0070	±2.05
120	0.819	-0.0061	±2.05
102	0.819	-0.0056	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (5M) CH26740(819MHz) –QPSK	Test Range	-20°C ~+50°C

#### Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0036	±2.05
-20	0.819	0.0037	±2.05
-10	0.819	0.0033	±2.05
0	0.819	0.0045	±2.05
10	0.819	-0.0061	±2.05
20	0.819	-0.0055	±2.05
30	0.819	-0.0042	±2.05
40	0.819	-0.0046	±2.05
50	0.819	-0.0053	±2.05

#### Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0049	±2.05
120	0.819	-0.0055	±2.05
102	0.819	-0.0059	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (5M) CH26740(819MHz) –16QAM	Test Range	-20°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	0.0043	±2.05
-20	0.819	0.0061	±2.05
-10	0.819	0.0046	±2.05
0	0.819	0.0065	±2.05
10	0.819	-0.0063	±2.05
20	0.819	-0.0052	±2.05
30	0.819	0.0049	±2.05
40	0.819	0.0055	±2.05
50	0.819	-0.0046	±2.05

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0044	±2.05
120	0.819	-0.0052	±2.05
102	0.819	-0.0073	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (10M) CH26740(819MHz)-QPSK	Test Range	-30°C ~+50°C

Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0051	±2.05
-20	0.819	-0.0042	±2.05
-10	0.819	-0.0032	±2.05
0	0.819	-0.0044	±2.05
10	0.819	-0.0055	±2.05
20	0.819	-0.0049	±2.05
30	0.819	0.0058	±2.05
40	0.819	0.0046	±2.05
50	0.819	-0.0058	±2.05

Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0045	±2.05
120	0.819	-0.0049	±2.05
102	0.819	-0.0035	±2.05

Product	Advanced Industrial 4G/LTE Router, WWAN Failover Manager		
Test Mode	Frequency Stability Under Temperature Variations & Voltage Variations		
Date of Test	2017/01/04	Test Site	CTR
Test Condition	Band 26 (10M) CH26740(819MHz)-16QAM	Test Range	-30°C ~+50°C

#### Frequency Stability Under Temperature Variations

Temperature Interval(°C)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
-30	0.819	-0.0041	±2.05
-20	0.819	0.0047	±2.05
-10	0.819	-0.0045	±2.05
0	0.819	0.0045	±2.05
10	0.819	-0.0059	±2.05
20	0.819	-0.0047	±2.05
30	0.819	0.0030	±2.05
40	0.819	0.0058	±2.05
50	0.819	0.0040	±2.05

#### Voltage Variations

AC Voltage (V)	Test Frequency (GHz)	Deviation (kHz)	Limit (kHz)
138	0.819	-0.0037	±2.05
120	0.819	-0.0047	±2.05
102	0.819	-0.0061	±2.05

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## Attachment 1: EUT Test Photographs



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## Attachment 2: EUT Detailed Photographs